U.S. Army Research Institute
for the Behavioral and Social Sciences

Research Report 1762

The Computer Background of Soldiers in Infantry Courses: FY99-00

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14. ABSTRACT *(Maximum 200 words)*:

The research determined the experience soldiers had with computers, their perceptions of their own skill, and their ability to identify commonly used icons. A survey was given to soldiers attending Infantry courses during FY99 and FY00. The report documents the FY00 results and compares them to FY99 results. The soldiers' ranks mirrored the structure of an Infantry rifle platoon. Lieutenants, most being recent college graduates, had the greatest computer expertise and were the most homogeneous on the indicators of computer skill in the survey. For the remaining soldiers, the picture was more diverse for both noncommissioned officers and junior enlisted members. A substantial portion of these groups had computer skills, but many had very limited skills. Based on these results, training on basic computer skills may be necessary prior to advanced training on digital systems used by rifle platoons. Although computer skill level for these soldier populations remained stable from FY99 to FY00, computer ownership increased. Because many soldiers indicated learning computer skills on their own, the increased percentage of soldiers owning computers may eventually translate to higher skill levels. The research will continue in FY01 to determine changes in computer expertise in the groups studied.

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Personnel Performance and Training Technology

FOREWORD

Digital systems are being fielded within the Army that will impact soldiers' skill requirements in basic and advanced computer functions as well as various content areas. The training associated with these skill requirements must be specified. Because soldiers' prior knowledge of and experience with computers will influence what training should occur, the extent of this prior knowledge and experience must be determined. The report provides findings from the second year of a three-year study examining computer backgrounds of Infantrymen. The computer background of Infantrymen ranging from privates to the platoon sergeant and platoon leader is described. The findings depict the status of these soldiers in FY00 and the stability of these findings as compared to FY99. The research will be continued in FY01 to determine possible changes in computer usage and expertise. In addition, the research is being expanded beyond the Infantry population.

Soldiers attending Infantry One Station Unit Training (OSUT), and students in the Basic Noncommissioned Officer Course (BNCOC), the Advanced Noncommissioned Officer Course (ANCOC), and the Infantry Officer Basic Course (IOBC) were surveyed. Overall, the lieutenants attending IOBC, most being recent college graduates, had the greatest computer expertise and were the most homogeneous on the objective and subjective indicators of computer skill in the survey. For the remaining junior enlisted and noncommissioned officer soldiers attending courses, the picture was more diverse. Although a substantial percentage of soldiers from these groups had computer skills, many had very limited skills. If training were to begin today on a digital system used by the soldier population sampled, the results indicate that prior training on basic computer skills would be required for many of these soldiers. Although the findings are limited to soldiers attending Infantry courses, it is likely that these results will generalize to other soldiers throughout the Army of similar ages and ranks.

The findings were briefed to representatives from Directorate of Operations and Training, U.S. Army Infantry School, TRADOC Systems Manager-Soldier, and Project Manager-Soldier in February and April 2000.

ZITA M. SIMUTIS
Technical Director

THE COMPUTER BACKGROUND OF SOLDIERS IN INFANTRY COURSES: FY99-00

EXECUTIVE SUMMARY

Research Requirement:

The Army has introduced digital systems throughout the force. Although many systems are for battalion and higher-level leaders, other systems are being developed for the individual soldier. The Land Warrior (LW) is a system designed for all Infantrymen as well as soldiers and units that support the Infantry such as medics, engineers, and field artillery. The LW is highly dependent on a computer system. The ability of soldiers to exploit the system capabilities and learn system software quickly depends in part on the user's prior computer experience. The research reflects findings from the second year of a three-year study that began in FY99. The overall purpose of the research was to obtain a picture of the computer backgrounds of soldiers in Infantry courses, to determine future training needs, and to determine trends in the computer backgrounds over time. The purpose of the FY00 research was to replicate the FY99 research using a sample of students attending FY00 courses to determine stability of the findings and to examine possible changes or trends in the backgrounds over time.

Procedure:

Soldiers were given a survey that examined their experiences with computers, self-perceptions of their skill, and an objective index of skill as measured by the ability to identify commonly used icons and icons representative of those in the proposed Land Warrior software. The survey was given to soldiers representing the rank and experience structure of an Infantry rifle platoon: Infantry One Station Unit Training (OSUT), Basic Noncommissioned Officer Course (BNCOC), Advanced Noncommissioned Officer Course (ANCOC), and Infantry Officer Basic Course (IOBC). A total of 713 soldiers was surveyed.

Findings:

In FY00, the IOBC lieutenants had the most computer expertise and were the most homogeneous on both objective and subjective indicators of computer skill. In the other groups the picture was more diverse; almost half the soldiers had limited skills. These groups ranked in order from high to low as follows: ANCOC, BNCOC, and then OSUT. Computer experience was gained in different ways. The youngest soldiers (OSUT) were most likely to have used computers in high school. IOBC soldiers had used computers in high school and in college. The IOBC and ANCOC soldiers were the most likely to own computers, however, more than half of BNCOC and OSUT soldiers also owned computers. All soldiers indicated they typically used computers at home, but a high percentage of ANCOC and BNCOC soldiers also indicated using

computers in their duty position. Self-ratings of computer expertise correlated with the icon scores.

The findings from FY00 were similar to the findings from FY99 indicating consistent results within the soldier populations examined. The primary change in results from FY99 to FY00 was that both the OSUT and IOBC groups showed an increase in use of computers in school (grade school through college), whereas soldiers in BNCOC and ANCOC did not. In addition, computer ownership increased for all groups except IOBC, which was already high.

Utilization of Findings:

The findings apply to other Army soldiers and leaders with similar educational and military experience. While it is true that younger soldiers in OSUT tended to have formal public school experience with computers, their formal training did not necessarily indicate proficiency. However, for the IOBC soldiers, this computer experience in public school and college did translate to high levels of skill. Important in skill development is the expertise that many soldiers gained either at work or at home. The greater percentage of soldiers owning computers in FY00 than in FY99 may impact soldiers' expertise in FY01. Because the surveys will be continued over the next year, any shifts or changes in trends within the groups surveyed in the first two years will be detected. The extent to which a training package for any of the Army's digital systems should include special training on basic computer skills will depend on the stability of these initial findings. However, if training were to begin today, the findings indicate that special training would be required for many Infantrymen who will use the Land Warrior and similar digital systems.

THE COMPUTER BACKGROUND OF SOLDIERS IN INFANTRY COURSES: FY99-00

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Introduction

The present research describes results from the second year of a three-year research effort on the computer backgrounds of soldiers. It is based on previous surveys by Dyer and Martin (1999) documenting the status of computer skills and knowledge of Infantrymen attending institutional courses. The FY00 research reported here, replicates the earlier work by Dyer and Martin on soldiers enrolled in Infantry courses. The purpose was to determine the stability of the FY99 findings using a new soldier sample from this population of soldiers. Because this study is the second year of a three-year study, another purpose of this research was to document any changes or trends.

The Army is fielding and testing many digital systems. The particular digital system that initiated the current program of research was the Land Warrior (LW) system (Goodman, 1999). The focus of the year one research (Dyer & Martin, 1999) was to determine the need for basic computer training for Infantrymen who will use the LW system prior to training on the LW software itself. The results revealed a dichotomy within the Infantry population in terms of computer expertise. It was found that a large percentage of Infantrymen were experienced computer users contrasting with a large percentage of computer novices. This dichotomy of computer expertise varied across Infantry sub-populations. Because of the large number of computer novices, it was concluded that if the LW system were fielded immediately, special training would be required on basic computer skills for some soldiers prior to computer training on the LW system itself. Training may need to be tailored to the diversity of computer expertise within the Infantry population. Experienced individuals will require more advanced training to increase skill level, whereas novices will experience great difficulty learning advanced material without first being exposed to introductory-level training (Van Vliet, Kletke, & Charkraborty, 1994). A "one size fits all" mentality of training will likely waste training time.

Dyer and Martin's (1999) research obtained a general picture of computer backgrounds within the distinct segments of the Infantry population making up a rifle platoon. The rifle platoon is composed of soldiers with considerable differences in Army experience, educational backgrounds, and ages. As was expected, their computer skills differed as well. The present research was designed to determine the stability of the results within the same population. We surveyed professional development courses at Fort Benning, Georgia which mirror all positions within a typical Infantry platoon except at the ranks of specialist and corporal. The institutional courses surveyed included One Station Unit Training (OSUT), Basic Noncommissioned Officer Course (BNCOC), Advanced Noncommissioned Officer Course (ANCOC), and Infantry Officer Basic Course (IOBC).

The first part of this report describes the results from the year two (FY00) surveys of the four institutional courses covered in FY99 by Dyer and Martin (1999): OSUT, BNCOC, ANCOC, and IOBC. The second part of the report examines the trends from FY99 to FY00. The same survey instrument was used both years.

FY00 Survey of Soldiers in Infantry Courses

Method

Participants

Soldiers from four professional development courses conducted at Ft. Benning, GA were surveyed (see Table 1). These courses were Infantry OSUT (n = 185, one company), IOBC (n = 189), BNCOC (n = 164, one class), and ANCOC (n = 175, one class). The distribution of ranks within each course is shown in Table 1.

Table 1
Number of Soldiers by Rank in Each Professional Development Course

Rank	**Soldier Group**			
	OSUT	BNCOC	ANCOC	IOBC[a]
Private	All 185	NA	NA	NA
Specialist/Corporal	NA	NA	NA	NA
Sergeant	NA	57	NA	NA
Staff Sergeant	NA	107	6	NA
Sergeant First Class	NA	NA	168	NA
Lieutenant	NA	NA	NA	All 189

Note. NA means "not applicable."
[a] Source of commission was available on the IOBC class (n = 189): 4% were prior noncommissioned officers being commissioned through Officer Candidate School (OCS); 47% were commissioned through Reserve Office Training Corps (ROTC), and 49% from the US Army Military Academy.

Figure 1 illustrates the overall trend in ages of the soldiers attending the professional development courses as well as the age spread within each course. Obviously, the youngest groups were Infantry OSUT (M = 19.89, SD = 2.31), and IOBC (M = 23.29, SD = 2.12). The oldest group was the ANCOC class (M = 32.82, SD = 3.96), with BNCOC about 5 years younger (M = 28.32, SD = 3.62). However, as illustrated in Figure 1 and documented in Table A-1, there was considerable variability in age, especially within ANCOC and BNCOC. The greatest range in age from youngest to oldest was ANCOC (24 years). This age difference was least within IOBC (8 years).

Because OSUT soldiers were not asked how long they had served in the Army, no data are presented on time in Army for this group. But as would be expected and as shown in Appendix A (Table A-2 and Figure A-1), the months served in the Army was lowest for IOBC (*Mdn* = 4 mons), next highest for BNCOC (*Mdn* = 94 mons, 7.8 yrs), and highest for ANCOC (*Mdn* = 146 mons, 12.2 yrs).

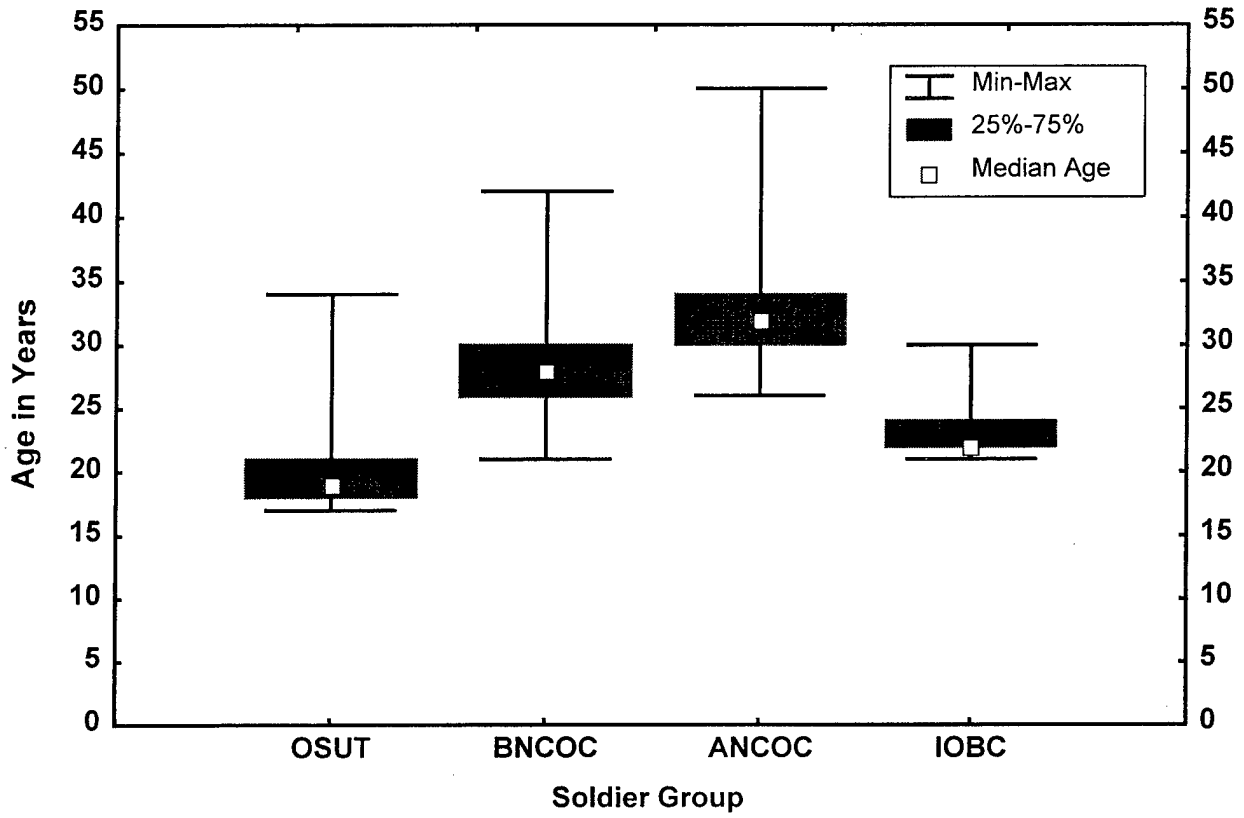

Figure 1. Box plot of soldier age in each group surveyed.

Survey Instrument

The survey instrument is presented in Appendix B. The same survey was used in the FY99 research (Dyer & Martin, 1999). The demographic information was tailored to fit the specific group surveyed (i.e., OSUT, ANCOC, BNCOC, and IOBC).

In addition to demographic information, the survey focused on seven areas:

- Where soldiers had used computers in their formal education.
- Where they currently use computers.
- Whether they owned a computer.
- How often they use specific computer features: a mouse, computer games, icon-based software, pull-down menus, graphics/drawing features, e-mail, and the Internet.
- Self-ratings of typing skill.
- Self-ratings of computer skill and what computer software/languages they use.
- An icon test where icons common in current software programs were presented and soldiers had to name the function of 18 icons. The icons were: spell check, cursor, zoom, open file, save, print, cut, copy, paste, undo, new file, arrow, recycle, help, center, fill, close, and group.

A coding scheme was developed for scoring the icon responses. It is presented in Appendix C. Some latitude was given to scoring answers, as the icons have slightly different meanings within various software programs.

Results

Computer Use

The survey was designed to obtain information about the soldiers' computer backgrounds. One background item was the degree to which soldiers used computers in their formal education. The percentage of soldiers using computers during their formal education varied across the groups. As illustrated in Figure 2, as soldiers progressed from grade school through high school, there was a steady increase in the percentage who used computers, regardless of the group surveyed. Because educational requirements varied across groups, the percentage using a computer in college did not apply equally to all the populations surveyed. However, almost all IOBC students (93%) used a computer in college. Examination of grade school through high school revealed that OSUT had the greatest frequency of use and ANCOC had the least frequency of use. Given that the availability of computers in school settings is a relatively recent phenomenon partially due to decreases in costs, it is not surprising that the percentage using computers in high school paralleled the average age of each group. Going from the youngest to the oldest group, the percentages of soldiers using computers in high school were as follows: OSUT (84%), IOBC (80%), BNCOC (49%), and ANCOC (25%). The very strong negative linear relationship ($r = -.982$) between the groups' mean ages and their use of computers in high school is shown clearly in Figure 3.

Another way of examining computer use in education was to total the number of educational settings where soldiers used a computer. Because few soldiers indicated technical school use (see Table A-3), these data were combined with the college category. The results are illustrated in Figure 4 and tabulated in Table A-4. A critical point shown in Figure 4 is that nearly half (48%) of the ANCOC soldiers and about one quarter (26%) of the BNCOC soldiers had never used a computer in a school setting. Of the soldiers from ANCOC and BNCOC who had used a computer during their education, it was typically in only one of the settings covered in the survey. This percentage was 45% for BNCOC and 38% for ANCOC. In contrast, more than half of OSUT (53%) and IOBC (56%) soldiers reported having used computers in three or more educational settings and only 5% of OSUT soldiers reported having never used a computer during their education. The difference in the number of settings where the groups used computers throughout their education was statistically significant, $\chi^2(12) = 355.22, p < .0000$.

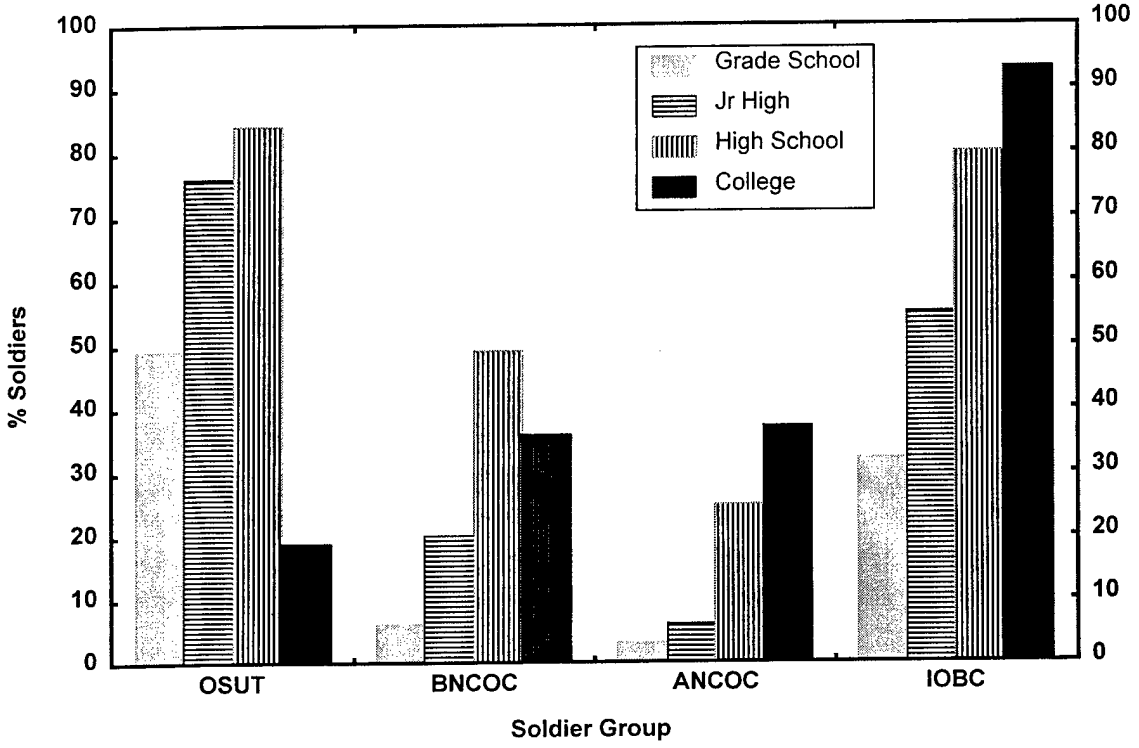

Figure 2. Percentage of soldiers using a computer in grade school, junior high, high school, and college.

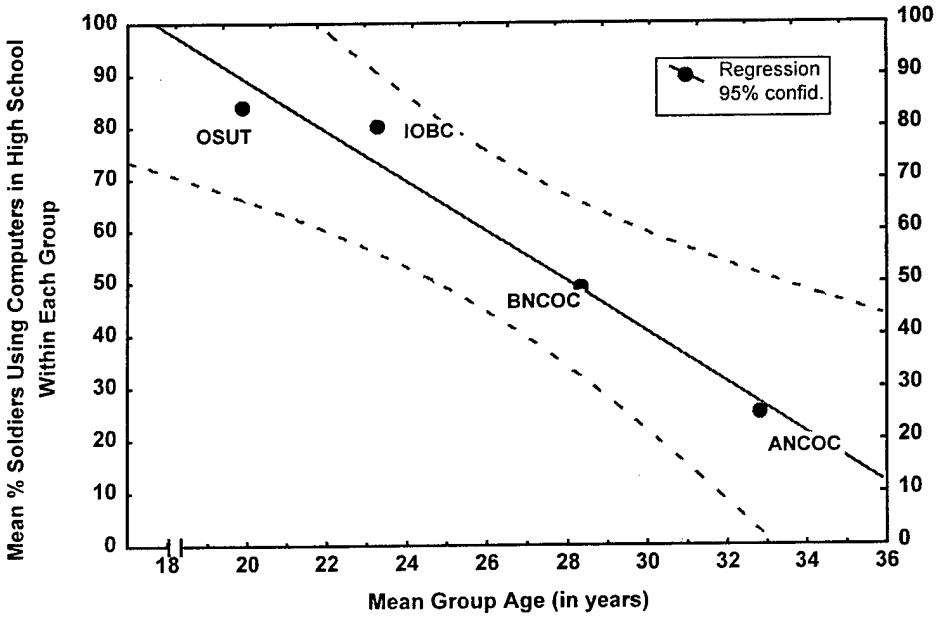

Figure 3. Relationship between mean age of the groups surveyed and use of computers in high school.

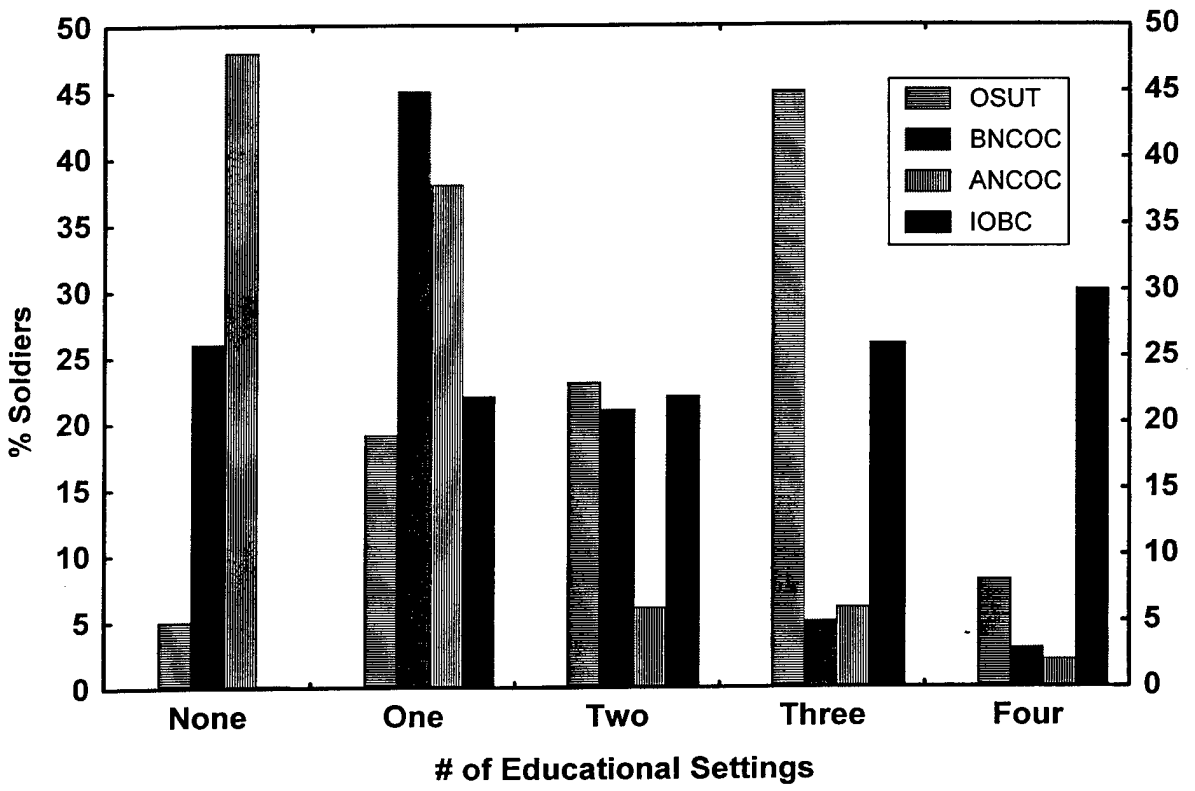

Figure 4. Number of educational settings (summed over grade school, junior high, high school, and college) where soldiers used computers.

One key question concerning computer use was whether soldiers owned a computer. Obviously, this could depend on whether they had a personal need for a computer, whether they could afford one, and other factors. These results are shown in Figure 5 and in Table A-5. The computer ownership percentages were high and similar for ANCOC (84%) and IOBC (82%). Although OSUT had the lowest percentage of computer ownership, over half (53%) of the soldiers currently own a computer. The difference among groups was significant, $\chi^2(3) = 55.03$, $p < .0000$.

We also asked where they used a computer now: at home (or in barracks or the bachelors officer quarters (BOQ)), in a training facility (library, learning center), and/or in their unit or work site. The locations available for soldiers to use computers depended on where they were stationed and their status within the Army (e.g., OSUT and most IOBC students have not been assigned to a unit). From these responses we computed the percentage of soldiers that currently use a computer (see Table A-5). As illustrated in Figure 5, at least 63% in each group said they currently used a computer, but the difference between groups was significant, $\chi^2(3) = 94.68$, $p < .0000$. It is clear from Figure 5 that, for each group, the percentage of soldiers using a computer was higher than the percentage owning a computer.

The most common location for using a computer was at home (in the barracks or BOQ). This percentage ranged from 35% to 87% across the four groups. Both BNCOC and ANCOC students indicated they frequently used the computer at work/in the unit. Although this type of usage was expected, the percentage of ANCOC and BNCOC students who indicated using a computer in their unit was high (73% and 62% respectively).

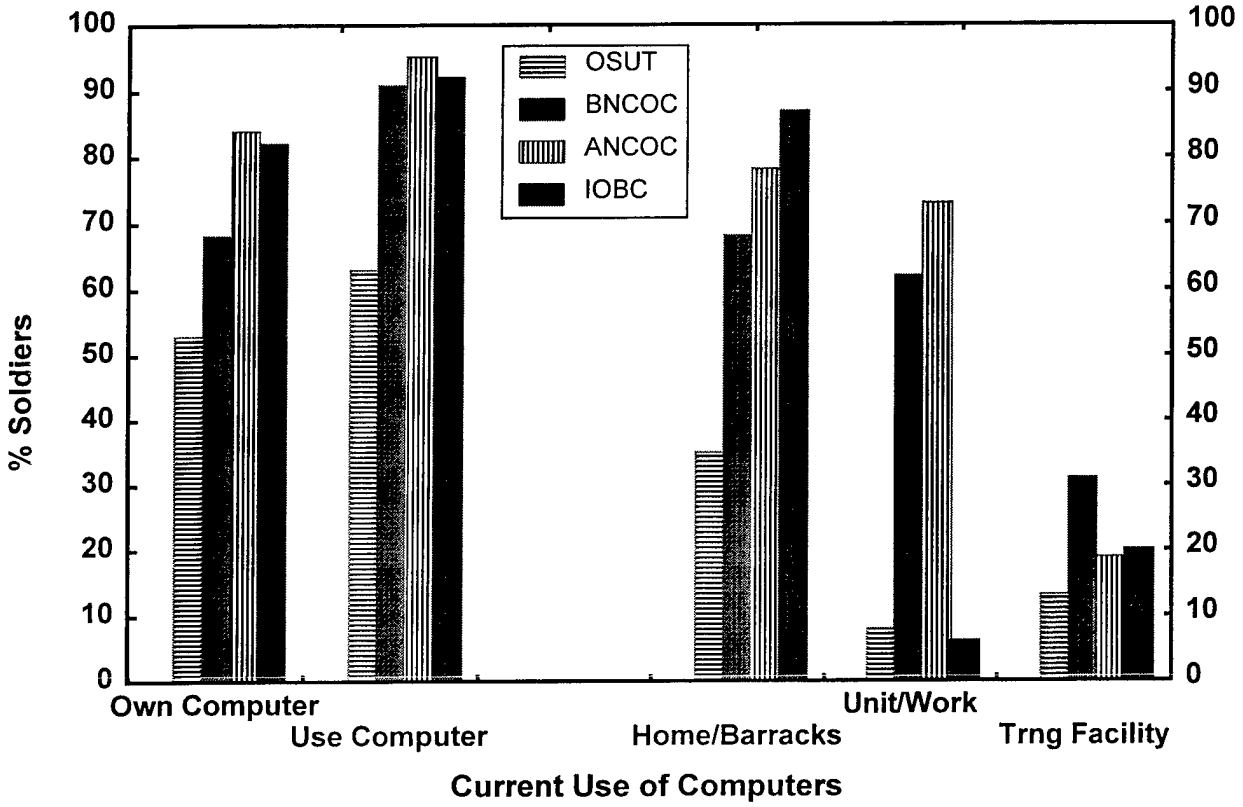

Figure 5. Current use of computers and usage locations.

Subjective Indices of Computer Skill and Expertise

The survey provided several subjective indices of computer skill: the frequency with which different software features are used, self-ratings of expertise with computer software, use of specific software packages, and self-ratings of typing skill. Although, typing skill is not a direct index of computer skill, soldiers who use a computer intensively are facile with a keyboard, whether it be touch typing or fast hunt and peck skills developed on their own. And those who know a typewriter keyboard will not be intimidated by this particular hardware interface.

Typing skill. The results on typing skill are presented first. Figure 6 shows that no more than 15% of any group indicated they had limited typing skills, i.e., could only hunt and peck slowly at a keyboard. There was a significant difference among the groups in their skill ratings,

$\chi^2(9) = 87.84, p < .0000$. As reflected in Figure 6 and in the difference between the expected and observed frequencies, the pattern of responses for the IOBC students differed from the other groups. For IOBC students, almost three-quarters (72%) stated they could type vs. hunt and peck. For each of the other groups, less than half (38% to 46%) stated they could type. In fact, the IOBC students were very likely to say that they could type quickly (47% vs. 15% for the other groups).

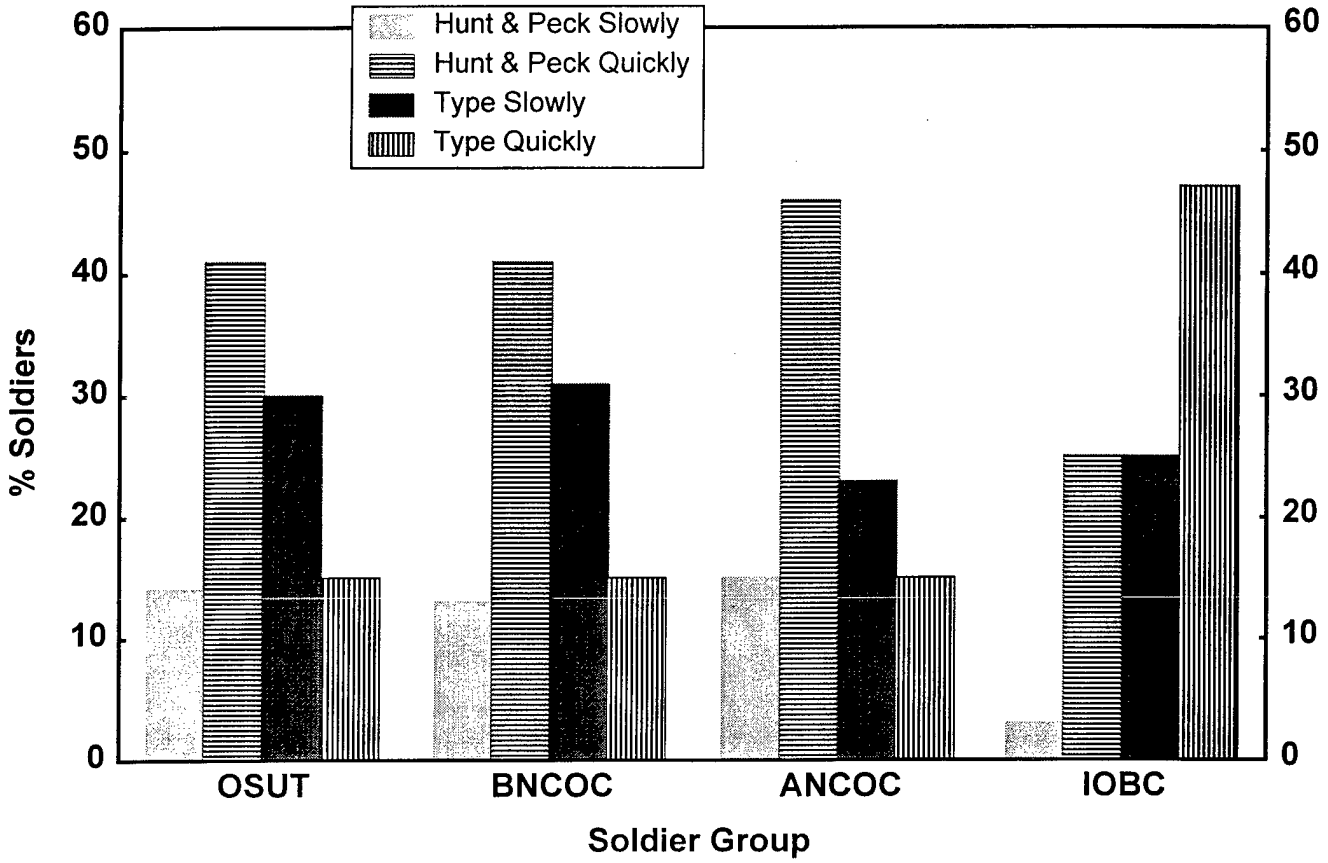

Figure 6. Typing ratings for each soldier group.

Computer features. Soldiers were asked how frequently they used seven computer features: mouse, games, software with icons, software with menus, graphics, e-mail, and the Internet. The frequency scale had five-points ranging from daily, weekly, monthly, less than monthly, to never (see survey in Appendix B). A complete tabulation of the responses by percentage of soldiers who responded to each category is in Table A-7. Means and standard deviations for each soldier group are in Table A-8. A 4 x 7 (soldier group by computer features with repeated measures on the last factor) analysis of variance (ANOVA) was used to statistically compare the soldier populations on the scale scores. There was a main effect for group, $F(3, 709) = 8.18, p < .0000$, a main effect for features, $F(6, 4254) = 256.35, p < .0000$,

and an interaction, $F(18, 4254) = 20.60$, $p < .0000$. The trends shown in the analysis of means are reflected in the breakout of responses by each usage category presented in Table A-7.

Post hoc comparisons (LSD test, $p < .05$) on the group main effect showed significant differences between OSUT and the other three groups (see means in Table A-8). However, IOBC, BNCOC, and ANCOC did not differ significantly in their use of features. Post hoc comparisons on the feature effect showed significant differences among all features, except that the use for Internet did not differ significantly from icons or menu use. From highest to lowest usage, the features ordered as follows: mouse, icons, Internet, menus, e-mail, games, and graphics. Finally, these overall effects were attenuated by the interaction. As reflected in the interaction shown in Figure 7, OSUT was generally ordered in accordance with the group main effect on mouse, icons, menus, icons, e-mail, and Internet features. Where this order shifted was on games and graphics. OSUT was highest on games and IOBC was lowest. On graphics, all groups indicated relatively low frequency of use and were relatively similar.

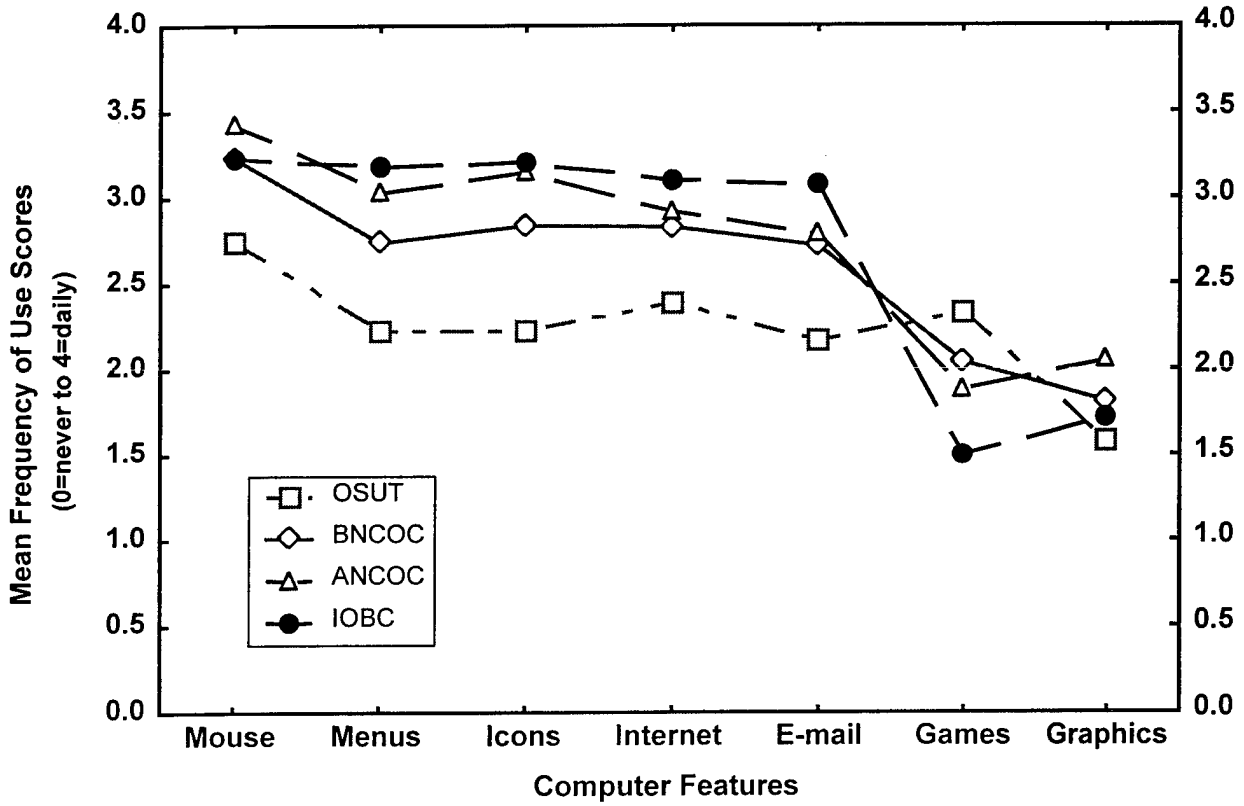

Figure 7. Interaction between soldier group and use of computer features.

Self-ratings of skill. Soldiers' ratings of their computer skill are displayed in Figure 8 (see also Table A-10). Approximately 45% of OSUT and BNCOC soldiers rated themselves as computer novices. The corresponding percentages in ANCOC and IOBC were 36% and 10%. Given the computer backgrounds of the different populations, it is not surprising that IOBC soldiers had the highest self-ratings; i.e., good with several programs or having the additional ability to program. The percentages of soldiers who rated themselves in these more experienced

categories were as follows: IOBC – 69%, ANCOC – 45%, BNCOC – 40%, OSUT – 37%. Figure 8 shows a dichotomous population containing both a large percentage of novices and more experienced users in OSUT, BNCOC, and ANCOC. The mean ratings for the groups (Table A-11) were statistically different, $F(3, 709) = 33.06$, $p < .0000$. Post hoc comparisons showed that IOBC had higher self-ratings than each of the other groups.

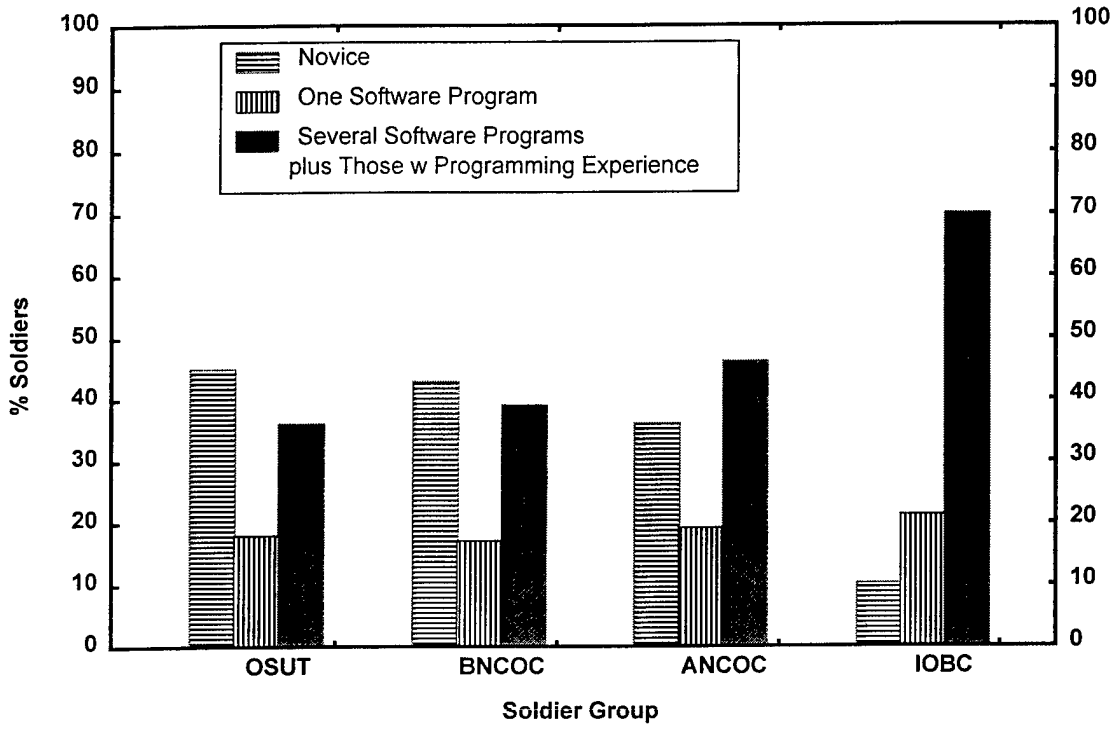

Figure 8. Self-ratings of computer skill.

Software programs and programming languages. The software reported by soldiers was divided into the five categories: office type, word processing, spreadsheet, graphics, operating systems, and "other." Across all groups, the most common software category was word processing, marked by 31% of all soldiers. The other five categories were each cited by 16% to 23% of the soldiers (see Table A-12). The most commonly reported software programs (see Table A-13) were Microsoft Word (27%), Microsoft Excel (22%), and Microsoft PowerPoint (15%). Microsoft Office was the most commonly reported office type software, and Microsoft Windows was the most commonly reported operating system. These patterns were typical of each group of soldiers. Other software programs reported by soldiers included Microsoft Works, Lotus Smart Suite, Microsoft Access, and various Internet and e-mail software. The BNCOC and ANCOC soldiers specified Delrina Form Flow. In general, IOBC soldiers indicated using the greatest variety of software programs across type.

With regard to programming languages, 10% of all soldiers cited programming languages. The most common programming languages cited by soldiers were Basic and Pascal. However, 24% of the IOBC soldiers reported knowledge of at least one programming language.

Some of the other languages commonly reported by IOBC were C++, ADA, HTML, JAVA, and FORTRAN. A more complete breakout of these responses is in Tables A-12 and A-13.

Icon Test Scores

Groups were compared on the total score on the icon test (see survey in Appendix B for icon test). A scoring code was developed for each icon (see Appendix C). Inter-rater reliability was determined to be 98% during the FY99 study and revisions were made to the scoring code (see Dyer & Martin, 1999). For the present study, 30 surveys were used to determine inter-rater reliability. Of the 540 total responses, there were 65 instances where the item was left blank. These items were not used in the analysis because there could be no disagreement for no responses. Out of the remaining 465, there were only 22 instances where the raters disagreed (inter-rater reliability = 95%).

The icon scores paralleled the expertise reflected in other survey measures, in that IOBC ($M = 11.95$, $SD = 2.63$) scores were highest, OSUT ($M = 7.43$, $SD = 3.35$) scores the lowest, and BNCOC ($M = 8.54$, $SD = 4.06$) and ANCOC ($M = 9.60$, $SD = 3.96$) scores were between these groups. Figure 9 depicts a box plot of the icon scores for each group. Significant differences occurred among the groups, $F(3, 709) = 55.68$, $p < .0000$. Descriptive statistics are in Table A-14. Post hoc comparisons of the means revealed significant differences between every group.

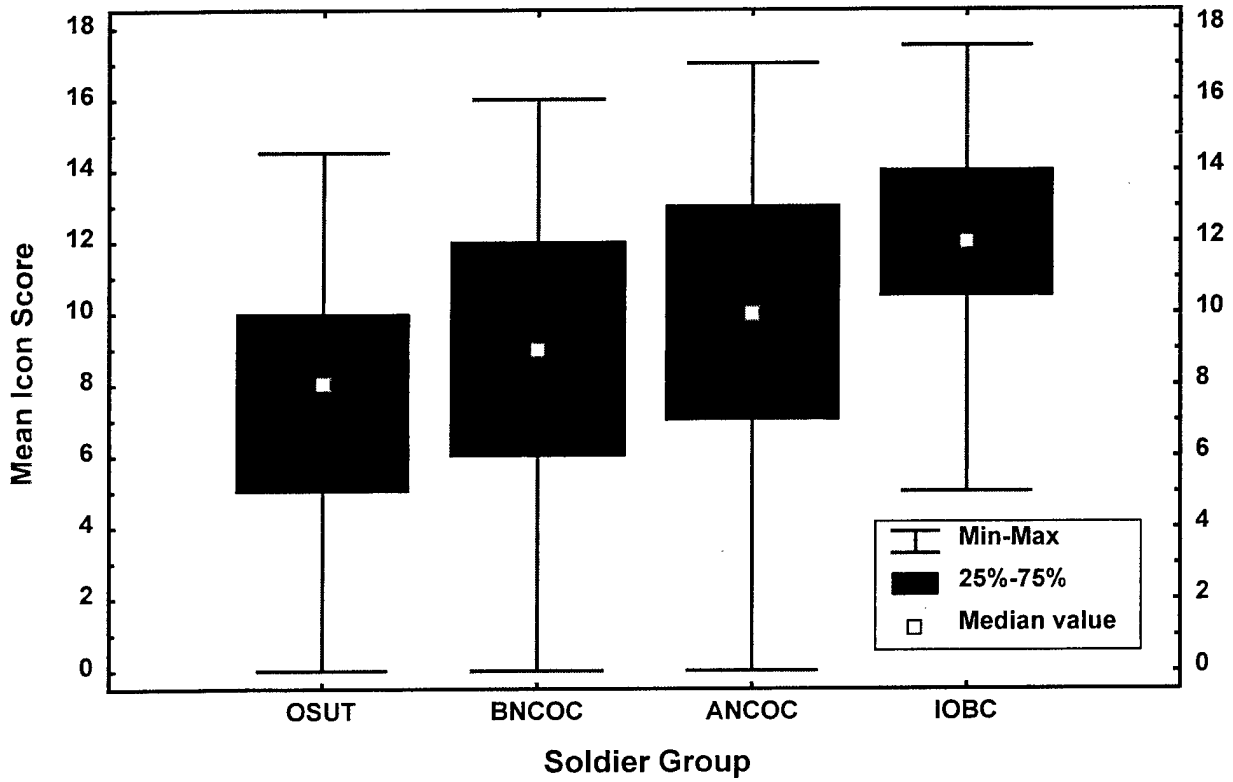

Figure 9. Icon scores by soldier group.

The individual icons differed in difficulty for all soldiers, ranging from a high of 84% correct for the recycle and cut icons to a low of 5% correct for the group icon. The solid line in Figure 10 depicts these percentages. The percentages for each soldier group are in Table A-15.

Several other findings are illustrated in Figure 10. The easiest icons (> 75% correct; recycle, cut, spell check, open file, print, and help) are labeled. The hardest items (< 25% correct, group, and arrow) are also labeled. The remaining ten icons (between 75% and 25% correct) were considered of intermediate difficulty. These icons were zoom, save, close, cursor, center, copy, undo, new file, fill, and paste.

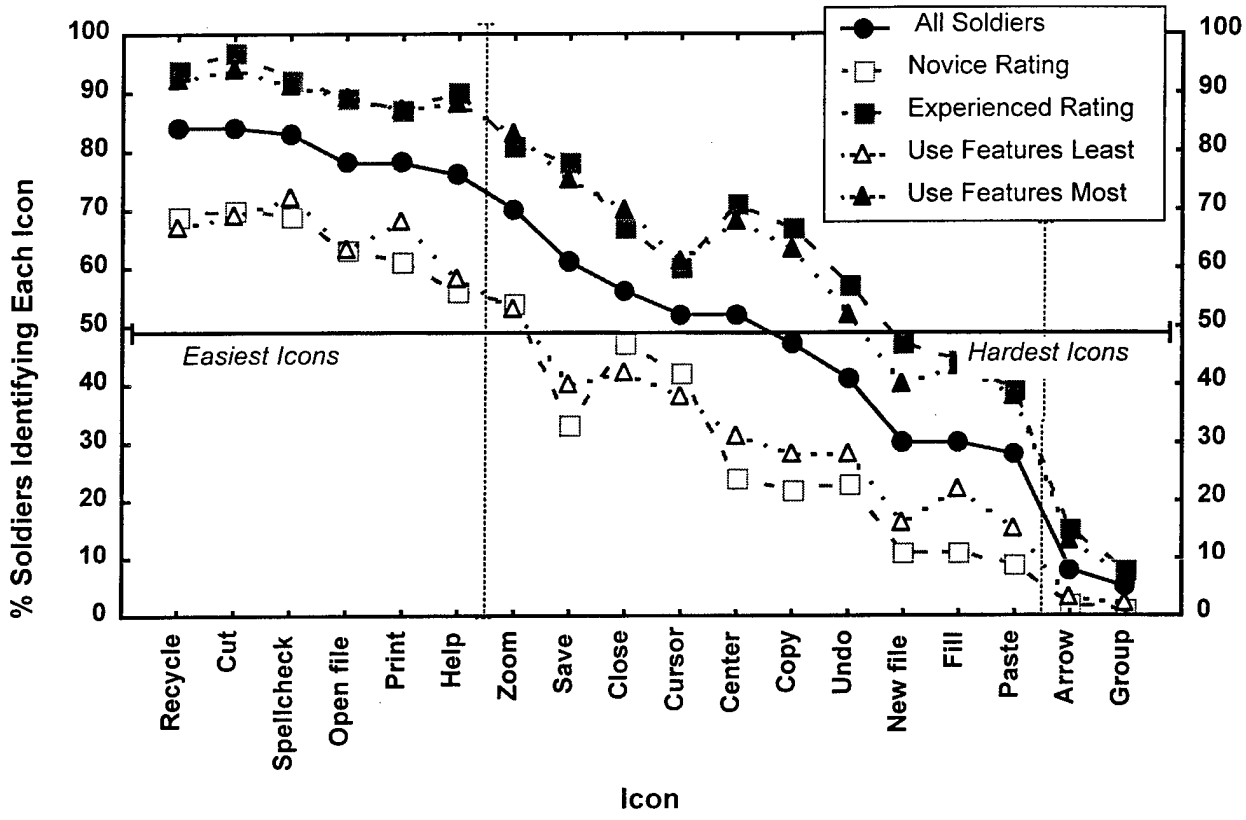

Figure 10. Icon difficulties for all soldiers, by high and low self-ratings, and by high and low use of computer features.

An additional question of interest was whether any survey measures that assessed computer backgrounds distinguished those soldiers who identified the icons from those who missed them. For example, if self-ratings of computer skill and ability to identify the individual icons were related, one would expect more of the experienced soldiers to identify the icons and fewer of the novices to do so. However, for the very difficult or very easy icons, there would likely be less discrimination and this pattern might not hold, as either "all" soldiers would miss the difficult icons or "all" soldiers would identify the easy icons. Figure 10 contrasts novices (n = 236) to soldiers experienced with at least several software programs as well as those who said

they could program (n = 343). The soldiers who stated they were experienced with only one program are omitted from this figure.

The results depicted in Figure 10 show a relationship between self-ratings and icon difficulty, with the more experienced soldiers consistently scoring higher than novices except for the two most difficult icons (group and arrow). In addition, the graph indicates that over half of the experienced soldiers identified 13 of the 18 icons correctly. On the other hand, over half the novices identified only 7 of the 18 icons correctly (see also Table A-16).

A similar analysis was conducted on the relationship between the frequency with which soldiers used the seven computer features covered in the survey and the individual icon scores. The feature usage frequencies were summed to generate a single index of use and the distribution divided into thirds. The actual number of soldiers included in the top third and bottom third varied slightly because of ties in the frequency index scores. The top third (n = 259, 36% of 713) of soldiers in terms of use was compared to the bottom third (n = 240, 34% of 713). The top third had usage scores of 23 and above, reflecting a weekly to daily use of all features. The bottom third had scores of 16 and below, reflecting use of all features on a much less frequent basis, less than monthly or never. The pattern of results was identical to that obtained with the self-ratings. These findings are in Figure 10 (see also Table A-17). In summary, soldiers' perceptions of their computer skill and the frequency with which they used common or typical computer features related to the individual icon scores, except when an icon was very difficult.

Relationships Among Indices of Computer Skill

Given the findings on the relationship between self-ratings and use of features with the individual icons, it was expected that the overall icon scores would relate to the background factors on the survey, both within each soldier group and for all soldiers. These correlations, all significant, are in Table 2.

Table 2
Correlations With Icon Test Scores

Variable	OSUT (n =185)	BNCOC (n = 164)	ANCOC (n = 175)	IOBC (n = 189)	All Soldiers (n = 713)
Use of Computer Features (Sum)	.51****	.65****	.65****	.24****	.54****
Self-Rating	.55****	.51****	.56****	.31****	.55****
Own a Computer	.25***	.48****	.35****	.18*	.38****
Currently Use a Computer	.24***	.35****	.42****	.15*	.33****
# Formal Education Settings Where Used a Computer	.28****	.24**	.30****	.24***	.26****

Note. * $p < .05$, ** $p < .01$, *** $p < .001$, **** $p < .0001$.

In general, the relationships that occurred for the entire sample were typical of each soldier group. The frequency with which soldiers used computer features and their self-ratings of skill correlated most highly with the icon scores. Computer ownership, whether soldiers currently used a computer, and the use of computers in formal schooling had lower relationships with the icon scores. The relatively low correlations for soldiers attending IOBC may reflect the homogeneous nature of IOBC. That is, most students owned computers and used them on a frequent basis.

For all soldiers, we also examined the relationship between the frequency with which each computer feature was used and computer ownership, current use of computers, self-ratings, and number of formal educational settings where a computer was used. These correlations are in Table 3. All were significant, except the correlation between use of mouse and the number of formal educational settings where a computer was used. The strongest correlates of feature usage were ownership and computer use, followed by self-ratings. The number of educational settings where a computer was used correlated relatively low with computer feature usage. This pattern held consistent across groups.

Table 3
Correlations With Use of Computer Features

Variable	**Computer Feature**						
	Mouse	Menus	Icons	Internet	E-Mail	Games	Graphics
Own a Computer	.58*	.54*	.58*	.60*	.59*	.30*	.39*
Currently Use a Computer	.60*	.52*	.55*	.51*	.49*	.21*	.34*
Self-Rating	.36*	.45*	.43*	.42*	.43*	.15*	.37*
# Education Settings Where Used a Computer	.07	.17*	.13*	.13*	.14*	.10*	.11*

Note. $N = 713$. * $p < .001$.

The relationship between computer ownership and feature usage rates is clarified in Figure 11 and in Table A-18. Figure 11 depicts the two extremes of feature use, the "never" and "daily" categories, as a function of computer ownership. For the soldiers who owned a computer ($n = 510$), the data points represent the percentage who used each feature on a daily basis as well as the percentage who had never used a particular feature. The corresponding percentages are given for those soldiers who did not own a computer ($n = 203$).

The graph clearly shows the impact of computer ownership on the likelihood of using the computer features covered in the survey. From 58% to 73% of those who owned a computer used a mouse, icons, menus, Internet, and/or e-mail on a daily basis, compared to 8% to 19% of those who did not own a computer. No more than 4% of those who owned a computer said they never used at least one of these features, compared to 18% to 43% who did not own a computer.

Experience with graphics and games was lower for all. Of those who owned a computer, 21% to 24% indicated daily use. Of those who did not own a computer, only 3% indicated daily use. Of those who owned a computer, 11% to 17% indicated never using these features; compared to 35% to 43% who did not own a computer and indicated no used of the same features.

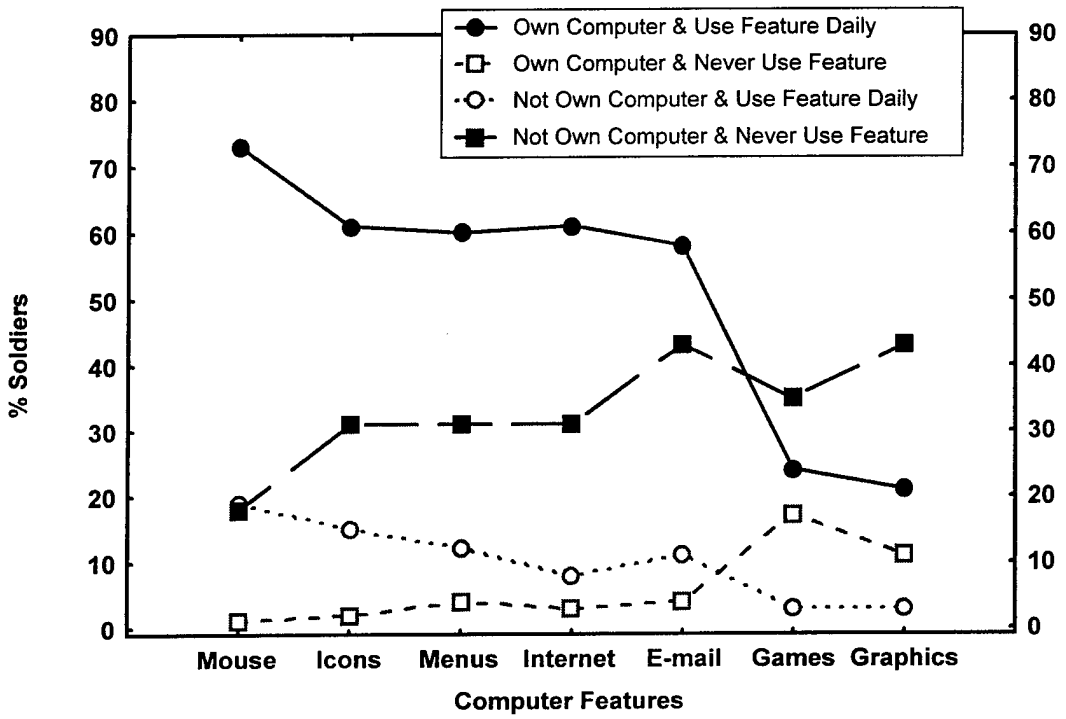

Figure 11. Relationship between computer ownership and frequency of use of computer features.

The correlations among the background variables themselves are in Table A-19. Consistent with the data in Table 3, use of all computer features correlated significantly with owning and using computers. Self-ratings correlated significantly, but less strongly, with these variables. Lastly, the number of educational settings where soldiers used computers did not correlate highly with the other background variables.

FY00 Summary

The results generally show a consistent picture among computer background and use, soldiers' perceptions of their skill, and an objective index of skill or knowledge. This picture is also consistent with the relatively rapid increase in the availability of personal computers in American society. That is, the youngest soldiers (OSUT) had the greatest exposure to computers

in high school. On the other hand, the oldest soldiers, those in ANCOC, did not have computers in high school. However, a high percentage of ANCOC soldiers owned a computer and many indicated using computers in their duty positions. In addition, most IOBC students had used computers in high school, and they also owned a computer, perhaps reflecting the demands made by today's colleges and universities on computer skills (most IOBC students had used a computer in college). All soldiers indicated that the most common location for using a computer was at "home." Thus computer experience was gained in different ways, reflecting the circumstances where computers were available to the different groups surveyed. And these circumstances reflected differences in the soldiers' age, their job, their schooling experiences, and whether they owned a computer.

The overall trend in the frequency with which selected computer capabilities or features were used was as follows (from most to least frequent): a mouse, software with icons, Internet, menu-driven software, e-mail, computer games, and graphics software. The groups surveyed differed somewhat in the frequency with which they used these capabilities. Soldiers in ANCOC, BNCOC, and IOBC indicated that they used Windows features such as icons and drop-down menus on a very frequent basis. Their use of Internet and e-mail features was also used on a very frequent basis, especially those who owned a computer. On the other hand, OSUT soldiers used computer features on a less frequent basis than the other soldiers with the exception of games. OSUT soldiers indicated use of games more frequently than other soldiers. The low use of graphics by all soldiers may have an impact on LW training as well as other digital systems relying heavily on leader application of computer graphic techniques to military maps.

The IOBC soldiers had the most computer expertise and were the most homogeneous on all indicators of computer skill. In the other groups, the picture was more diverse with about half the soldiers having limited skills. These groups ranked in order from high to low as follows: ANCOC, BNCOC, and then OSUT. About 45% of the OSUT and BNCOC groups rated themselves as computer novices; whereas only 10% of IOBC rated themselves as novices. With regard to the icon scores, 46% of ANCOC soldiers, 55% of BNCOC soldiers, and 69% of OSUT soldiers scored below 50% correct on the test. This compares to 16% of IOBC scoring below 50% correct.

The self-ratings and the icon scores were used to estimate the percentage of soldiers likely to need training in basic computer skills before learning a specific software package. First, we determined the percentage of soldiers who scored 50% or less on the icon items. Second, we determined which of these soldiers also rated themselves as novices or good with only one program (see Table A-20). This later percentage was always less than that based on the icon cut-off only. The point estimate of the percentage of soldiers needing training in basic computer skills was then defined as the mean of these two values. The spread around this estimate was based on the two values themselves: the upper limit was the percentage of soldiers scoring 50% or less on the icon test, while the lower limit was the percentage scoring 50% or less on the icon test who also rated themselves as novices or good with only one program. Using these values we obtained the following estimates of the percentages of soldiers needing training in basic computer skills:

OSUT	62% +/- 7%
BNCOC	50% +/- 5%
ANCOC	42% +/- 4%
IOBC	13% +/- 3%

The estimate was highest for OSUT and least for IOBC. The accuracy of these estimates was the least precise (greatest spread) for OSUT and the most precise (least spread) for IOBC.

The findings are a snapshot of the computer background of Infantrymen in FY00. But they can apply to soldiers in other branches of the Army with similar educational and military experience. The next section of the report compares the FY00 and FY99 data.

Trends in Infantry Courses From FY99 to FY00

Method

Although large changes were not expected in a one year period, the personal computer industry has had rapid changes in the past few years. These changes have resulted in the potential for greater availability of computers to all populations. If greater percentages of soldiers are using computers, skill level should also change over time. The FY99 data on the OSUT, BNCOC, ANCOC, and IOBC courses from the Dyer and Martin (1999) report are compared to the FY00 data from the soldier sample just presented in this report. Each effort could be considered a study of trends, as the ages of the soldiers in each group differed. But by comparing the two efforts, we gain a broader picture of what is happening to Infantrymen. A slightly different generation of soldiers is represented by each of the FY00 courses, as the soldiers were born in different years from the FY99 sample. But each FY00 group was about the same age as the corresponding group in the FY99 sample. Thus this comparison could be considered equivalent to a time-lag design, where changes with time are determined by testing individuals of the same age in different years.

The trend analysis addressed three questions. First, were there changes from one year to the next regardless of the groups compared? Second, were there group differences that lasted across time. Third, did any groups show a differential rate of change over the one-year period from FY99 to FY00. The two databases were pooled for the statistical analyses. Demographic comparisons are presented first, followed by computer usage and ownership findings. Lastly, comparisons are made on the subjective and objective indices of computer skill.

Results

Sample Size

The sample sizes for each course in both years ranged from 150 to 189 soldiers. The exact numbers for FY00 were cited earlier. The corresponding numbers for FY99 were: 150 for OSUT; 175 for BNCOC, 180 for ANCOC, and 188 for IOBC.

Demographic Measures

When ordering the courses by the mean age of the students taking the survey, the order was the same each year. From youngest to oldest, it was OSUT, IOBC, BNCOC, and then ANCOC. The mean ages differed significantly as reflected in a two-way ANOVA, where the course effect was significant, $F(3, 1396) = 1205.63, p < .0000$. In addition, there was a significant effect for year, $F(1, 1396) = 27.14, p < .0000$. The soldiers in the FY00 sample were about one year younger than those in the FY99 sample ($M = 26.94$ and 26.08. $SD = 5.79$ and 6.06 respectively). In addition, year and group interacted significantly, $F(3, 1396) = 10.81, p < .0000$. Except for BNCOC, the soldiers in the FY00 year sample were younger than those in the FY99 year sample. For OSUT, the FY00 year group was one year younger than the FY99 sample ($M = 19.89$ vs 20.99). For ANCOC, the FY00 year group was two years younger than the FY99 sample ($M = 32.82$ vs. 34.96). For IOBC, the FY00 year group was three-quarters of a year younger than the FY99 sample ($M = 23.29$ vs 24.06). In contrast, for BNCOC, the FY00 year sample was half a year older than the FY99 sample ($M = 28.32$ vs. 27.78).

Computer Use and Ownership

A general picture of computer use is illustrated in Figure 12. It shows the percentage of soldiers who used a computer at some time during their formal education. Also depicted are the percentages who currently use a computer and who own a computer. The general trend was either up or steady in each area and for each group from FY99 to FY00.

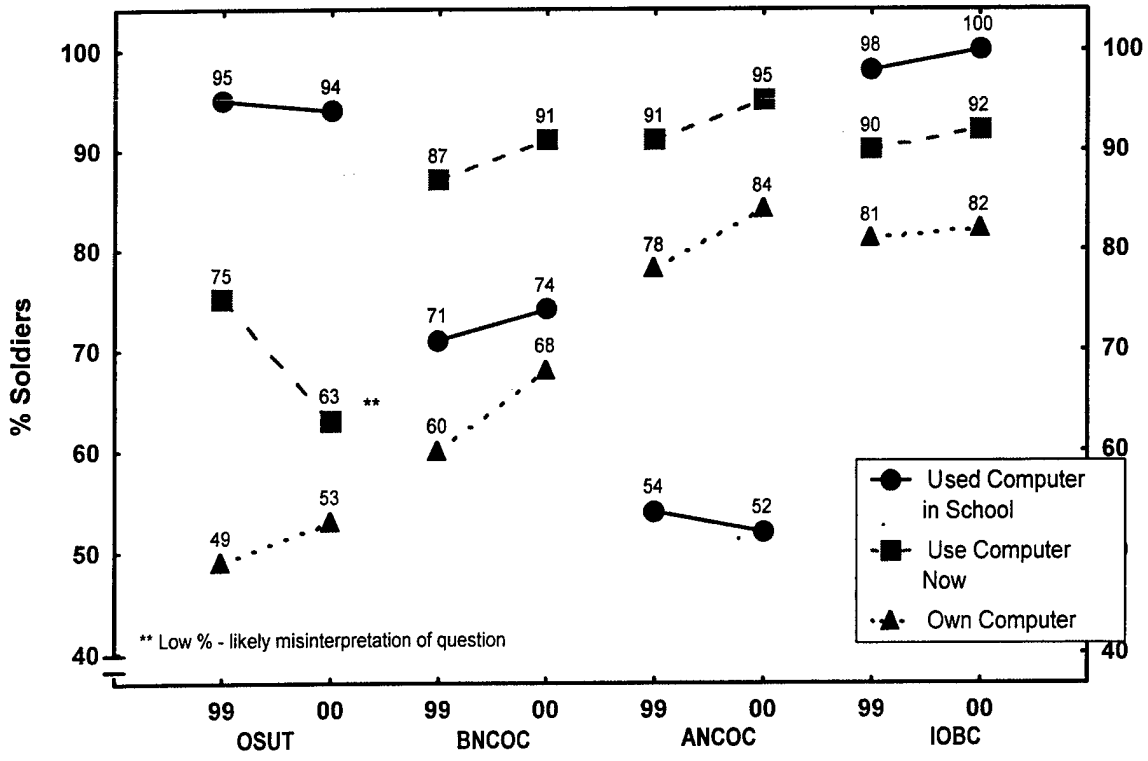

Figure 12. Trends in computer ownership and computer usage.

In examining computer ownership for all courses, a 4 x 2 (course by time) ANOVA showed significant course differences over both years, $F(3, 1372) = 38.14, p < .0000$. Post hoc comparisons (LSD test) showed that, over both years, ownership in IOBC and ANCOC (each $M = 81\%$) was higher than that in both BNCOC ($M = 64\%$) and OSUT ($M = 51\%$). IOBC and ANCOC ownership rates did not differ. There was no significant change over time in ownership ($M = 67\%$ for FY99 and 72% for FY00), although this effect was almost significant at the .05 level, $F(1, 1372) = 3.66, p < .0558$. There was no significant interaction between time and course. The percentage of IOBC soldiers that owned computers increased by only 1% (see Figure 12). Even though the course by year interaction was not significant, we repeated the ANOVA without the IOBC soldiers to determine if there was an overall increase from FY99 to FY00 for the three other courses. In this case, we found a significant year effect, $F(1, 1003) = 4.33, p < .0376$; $M = 62\%$ for FY99 and 68% for FY00. So for these three groups combined (OSUT, BNCOC and ANCOC), there was a significant increase in computer ownership from FY99 to FY00.

Another index of computer experience was the percentage of soldiers who use a computer. As illustrated in Figure 12, in both years computer use was high and similar for BNCOC, ANCOC and IOBC (about 90%). The usage rate for OSUT was lower (63% to 75%). An ANOVA comparing usage rates over time for the courses resulted in a main effect for courses ($F[3, 1394] = 35.82$, $p < .0000$) and a significant interaction ($F[3, 1394] = 4.60$, $p < .0032$.. The interaction was produced by the drop in usage in FY00 by OSUT soldiers. We believe that this drop in OSUT reflects a misunderstanding of the question by many OSUT soldiers. In examining the individual surveys, even though a soldier may have said he did not "use a computer now," other responses indicated he used a computer. For example, in some instances he indicated he owned a computer, used the internet and even listed the software programs he used. So apparently, some OSUT soldiers did not realize that the "use" question referred to a broader span of time than their time in OSUT per se. This was not the case with BNCOC and ANCOC, where these soldiers reported using computers in their "duty position," even though they were officially in school. Consequently, a second analysis was conducted without the OSUT sample. In this case, there were no significant effects for time or course, and no significant interaction.

We know the numbers of computers in schools is increasing. Consequently, shifts in the use of computers in schools over time within the Infantry population was of particular interest. The relative wide age range of the soldiers in the surveys provided an opportunity to examine shifts within our society over a substantial period of time.

The prior figure, Figure 12, showed that the youngest groups (OSUT and IOBC) were more likely to have used a computer sometime in their formal schooling than the older groups (BNCOC and ANCOC). When these data were broken out by use in grade school, junior high, high school, and college, we found that the shifts in usage from FY99 to FY00 were primarily with the youngest soldiers (see Figure 13). The two greatest increases were in OSUT: a 14% increase in usage in both grade school (35% to 49%) and junior high (62 to 76%). The next two greatest changes were with IOBC students: an 8% increase in both high school (72% to 80%) and college (88% to 96%).

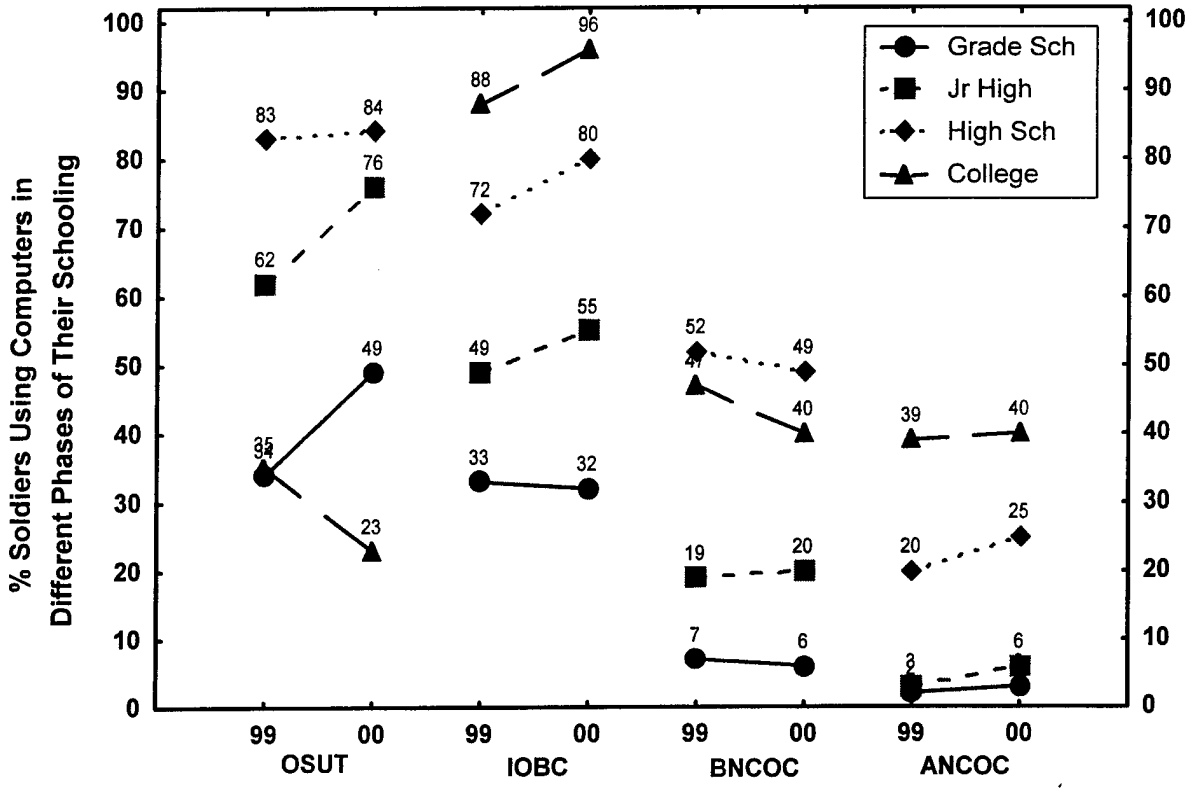

Figure 13. Trends in use of computers in different phases of school. (Courses ordered by mean age of soldier, from youngest to oldest.)

To statistically examine the change in use of computers in schools over time, we compared the groups on the total number of educational settings in which they had used computers. The technical school and college categories were combined, as few soldiers marked technical school. Thus for an individual soldier, the number of educational settings could range from 0 to 4. There was a significant effect for group, $F(3, 1404) = 236.74$, $p < .0000$. From high to low the groups ordered as follows: IOBC ($M = 2.53$, $SD = 1.20$), OSUT ($M = 2.23$, $SD = 1.09$), BNCOC ($M = 1.18$, $SD = 1.06$), and ANCOC ($M = .70$, $SD = .84$). Although the effect for year was not significant at the .05 level, it was at the .10 level, $F(1, 1404) = 3.12$, $p = .0775$, and bears mentioning as indicative of an upward trend in school use rates across all groups. The mean for FY99 was 1.62 ($SD = 1.29$); the mean for FY00 was 1.71 ($SD = 1.29$).

Figure 14 shows the percentage of soldiers within each of these categories, and reflects the differences in the group means just discussed. For example, in terms of total educational experience, the IOBC soldiers had the most experience regardless of the year of the survey. Refer to the percentage of soldiers in the "3 Settings" and "4 Settings" column segments in Figure 14. On the other hand, the BNCOC and ANCOC soldiers had the least experience

regardless of the year, as indicated by the percentage of soldiers in the "Not Used" and " 1 Setting" column segments in Figure 14. Use in school usage is clearly a function of age, plus the fact that IOBC students have attended college. The greatest shift from FY99 to FY00 was in OSUT. There was an 18% increase in soldiers having used computers in three educational settings. In general, this means an increase in the use of computers throughout their education, from grade school through high school. Also of interest is that the percentage of BNCOC and ANCOC soldiers who had never used a computer in school remained relatively constant.

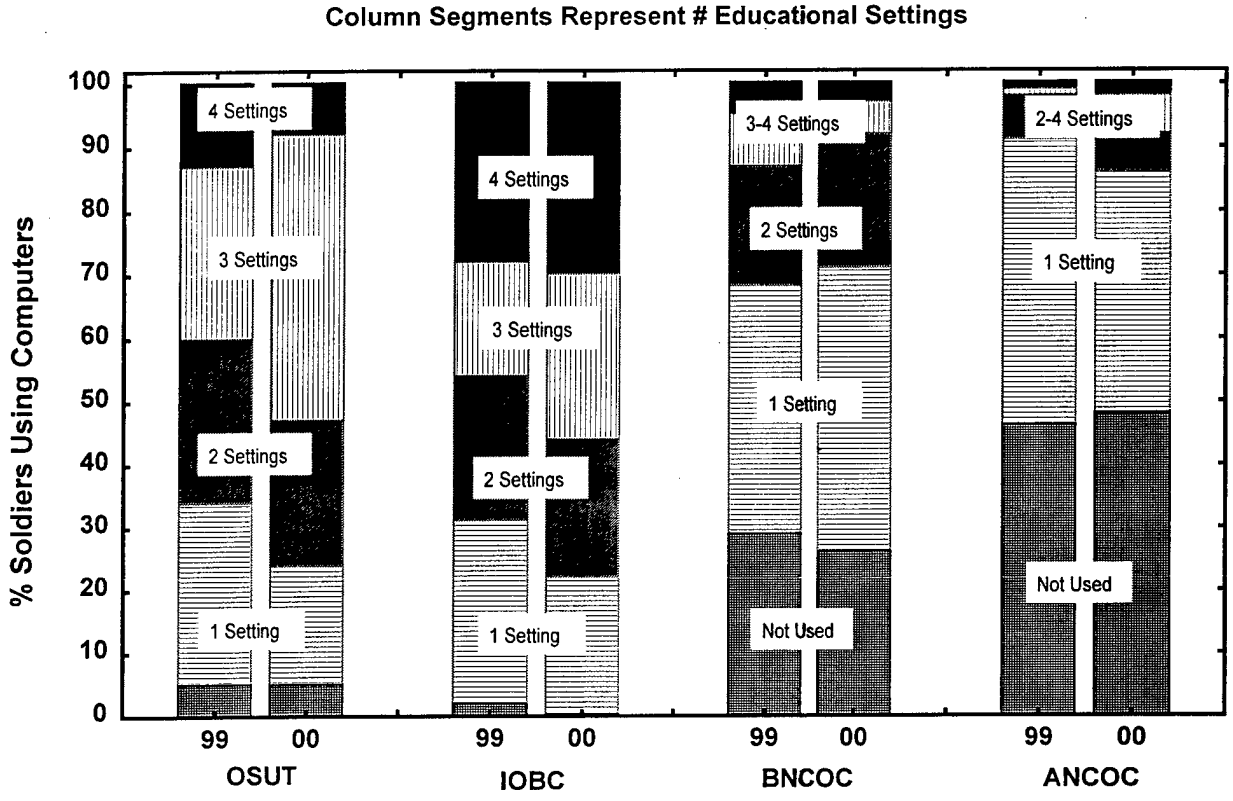

Figure 14. Trends in use of computers in different numbers of educational settings (Courses ordered by mean age of soldier, from youngest to oldest. Percentages for each year and course combination sum to 100%.)

We also examined the percentage of soldiers who used a computer in high school for each of these groups as a function of the year they were in high school. We estimated this year based on when each group's mean age would have been 17. Even though the two samples were taken one year apart and many soldiers in both groups were the same age, the relationship between their estimated year in high school and the percentage using a computer in high school was very strong ($r = .98, p < .0000$). This graph reflects the rapid shift within our society as computers have become increasingly common in the public schools, over the 16-year span from 1984 to 1999.

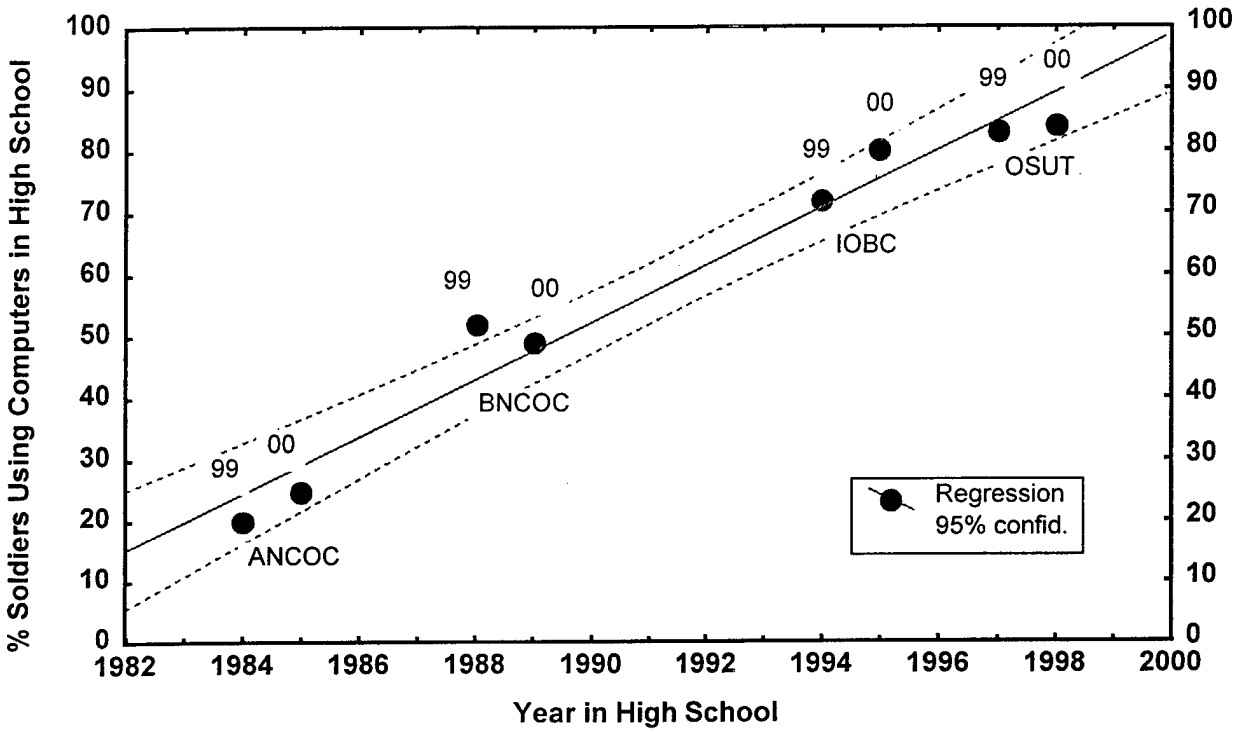

Figure 15. Relationship between year in high school and percentage soldiers using a computer in high school.

A multivariate analysis of variance (MANOVA) was conducted on the seven computer features (e.g., mouse, icons, internet) covered in the survey. Both the year and the group effects were significant: Wilks' $\Lambda = .96$, Rao's R (7, 1386) = 8.15, $p < .0000$ for year; and Wilks' $\Lambda = .79$, Rao's R (21, 3928) = 16.25, $p < .0000$ for group. Figure 16 shows the mean usage rates for each feature in FY99 and FY00. Univariate tests on each feature showed significant changes over time for Internet, e-mail, games, and graphics, but not for mouse, menus, and icons. Figure 17 shows the mean usage rates for soldiers in each course across both years. In this case, univariate tests showed significant differences among the courses on each feature. As illustrated in Figure 17, the ordering of the groups was fairly consistent on five features (IOBC, ANCOC, BNCOC, and then OSUT). But on games and graphics, the order changed. For games, OSUT was highest and IOBC was lowest. For graphics, ANCOC was the highest.

Indices of Expertise

An ANOVA was conducted on the six-point, self-rating scale. The only significant effect was that of group, $F(3, 1404) = 55.07$, $p < .0000$. Over both years, post-hoc comparisons (LSD test) showed that IOBC ($M = 2.91$, $SD = 1.10$) had higher self ratings than soldiers in each of the other courses (ANCOC, $M = 2.23$, $SD = 1.03$; BNCOC, $M = 2.09$, $SD = 1.11$; OSUT, $M = 1.99$, $SD = 1.04$) In addition, ANCOC had significantly higher self-ratings than OSUT. Figure 18

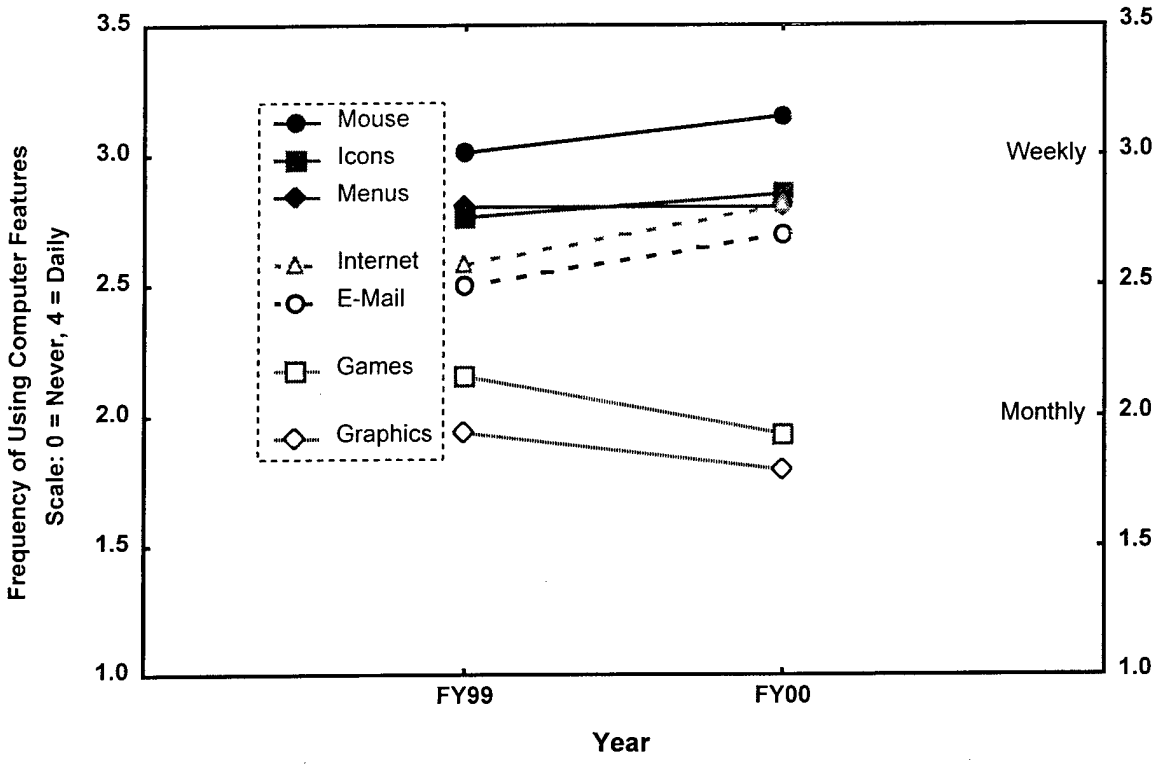

Figure 16. Use of computer features by survey year.

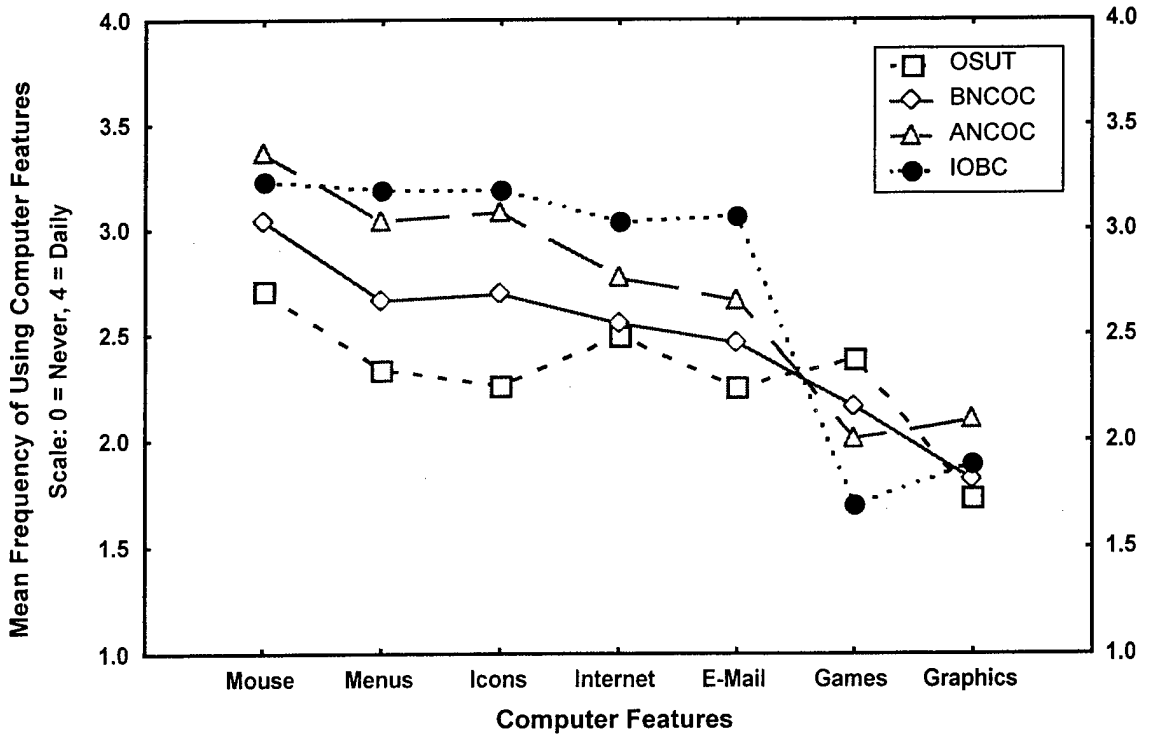

Figure 17. Use of computer features by Infantry course across both years.

depicts how the soldiers rated themselves in each category. The six-point scale was collapsed by combining the three categories that indicated some expertise in programming. Figure 18 shows four categories: the percentage of soldiers who rated themselves as a novice, as good with one software program, as good with several programs, or as having some expertise in programming (the top three categories on the scale, see survey instrument in Appendix B). Figure 18 illustrates the similarity in self-ratings from FY99 to FY00 reflected in the mean scores.

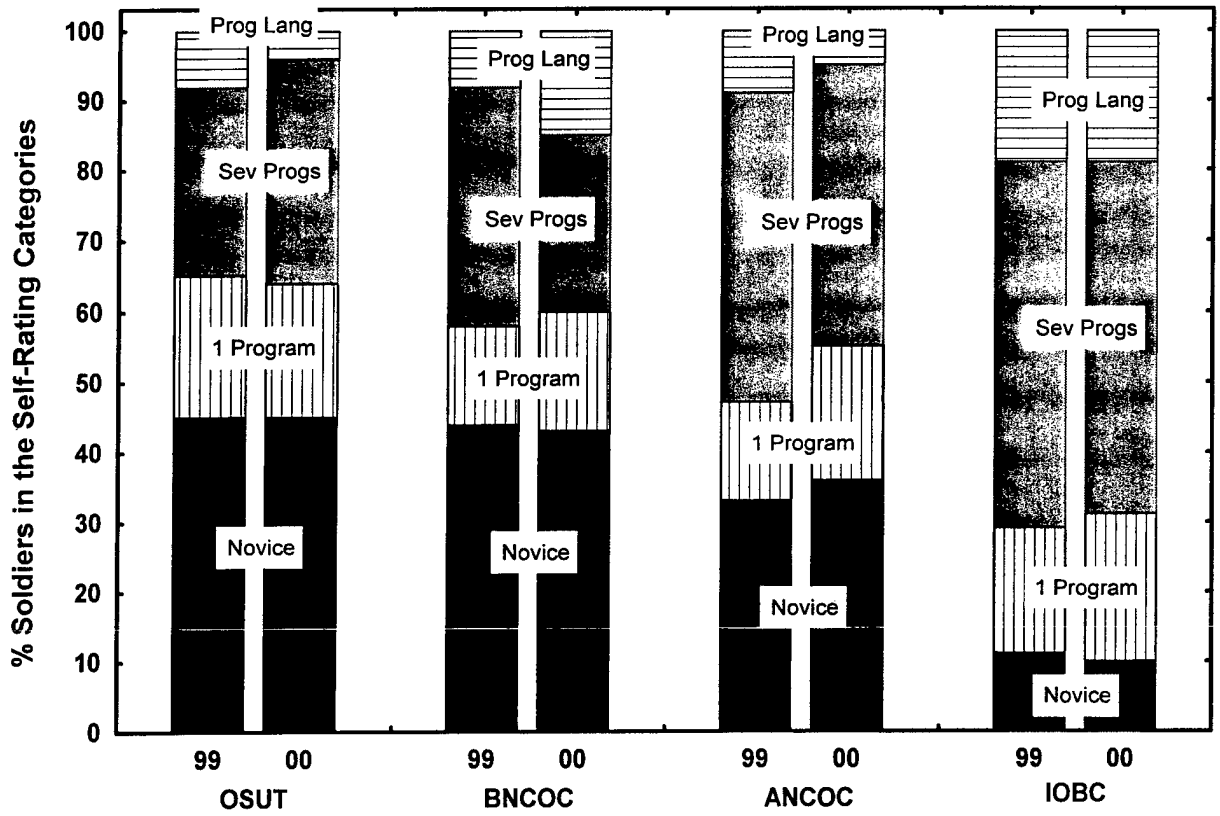

Figure 18. Self-ratings by each course and survey year. (Percentages for each year and course combination sum to 100%. Courses are order from low to high by self-ratings.)

The trends in experience with specific software programs and programming languages were not as reliable as the other results, because not all soldiers responded to this free-response question on the survey. However in both years, word processing programs were used most commonly by soldiers, followed by spreadsheets and briefing slide presentations. In FY00, the most commonly cited software packages in these areas were those produced by Microsoft Corporation (Word, Excel, and Powerpoint). In FY99 this was also the case, but there was more frequent mention of other commercial packages. In FY00, the BNCOC and ANCOC soldiers cited Delrina Form Flow, a software package used for completing a myriad of military forms. In FY00, the greater depth of computer expertise possessed by the IOBC students, probably as a

result of their college work, was clearer. They listed a greater variety of software programs than the other groups, and they also had more programming experience, with 24% citing experience with at least one programming language as compared to 13% in FY99.

The other index of experience was the icon score. An ANOVA on the icon scores resulted in a significant effect for group, $F(3, 1039) = 75.07$, $p < .0000$. Over both years, post-hoc comparisons (LSD test) showed that each group differed significantly from each of the others, with IOBC the highest ($M = 11.65$, $SD = 2.87$), then ANCOC ($M = 9.72$, $SD = 3.97$), followed by BNCOC ($M = 8.37$, $SD = 4.31$), and lastly OSUT ($M = 7.17$, $SD = 3.50$). Only IOBC and ANCOC soldiers averaged over 50% correct over both years. Figure 19 clearly shows the consistent ordering of the courses on the icon scores for both years, as well the course means for each year.

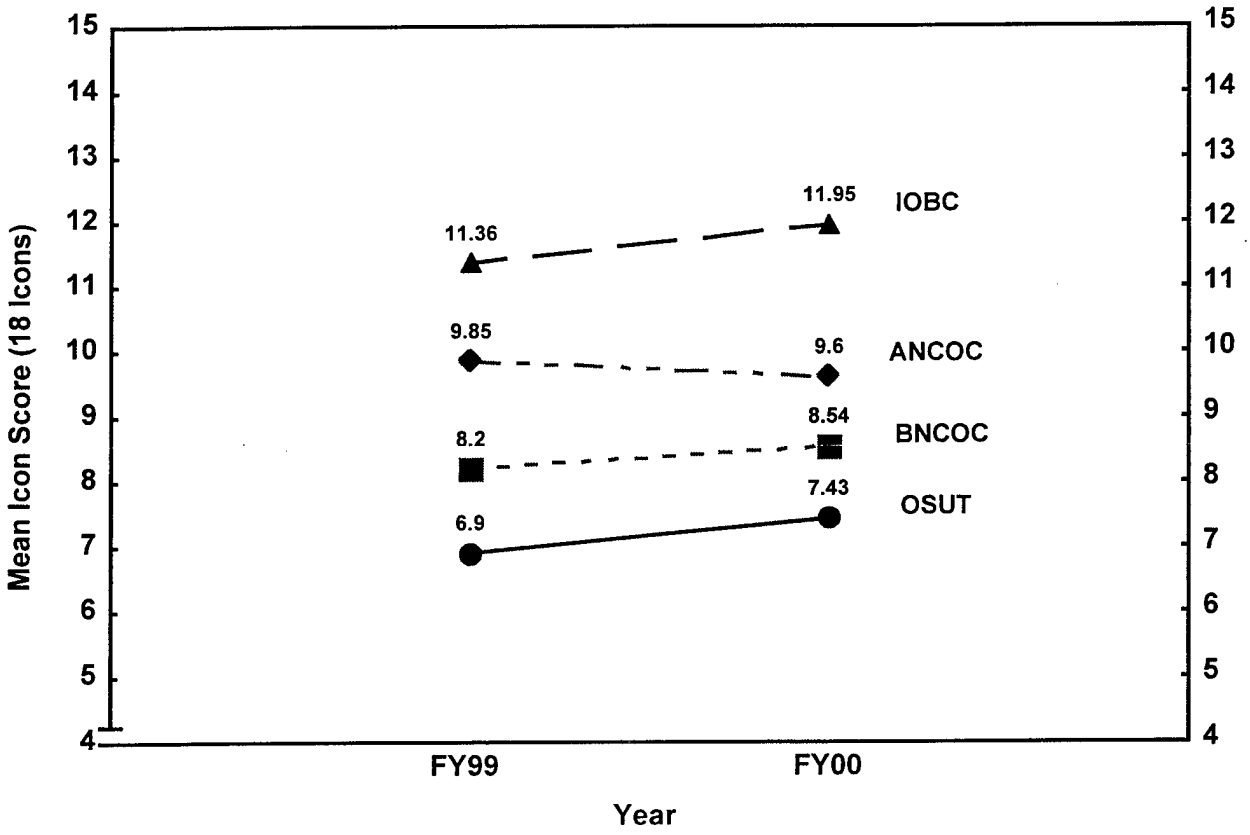

Figure 19. Mean icon scores for each course by survey year. (Significant effect for course; no significant effect for year; no significant interaction.)

Figure 20 shows the mean percentage of soldiers who correctly identified each icon in FY99 and FY00. Of interest is the very similar ordering of difficulty from one year to the next. Except for one icon, cursor, these percentages were slightly higher in FY00 or equivalent to FY99, showing overall progress, although the change from FY99 to FY00 was not significant.

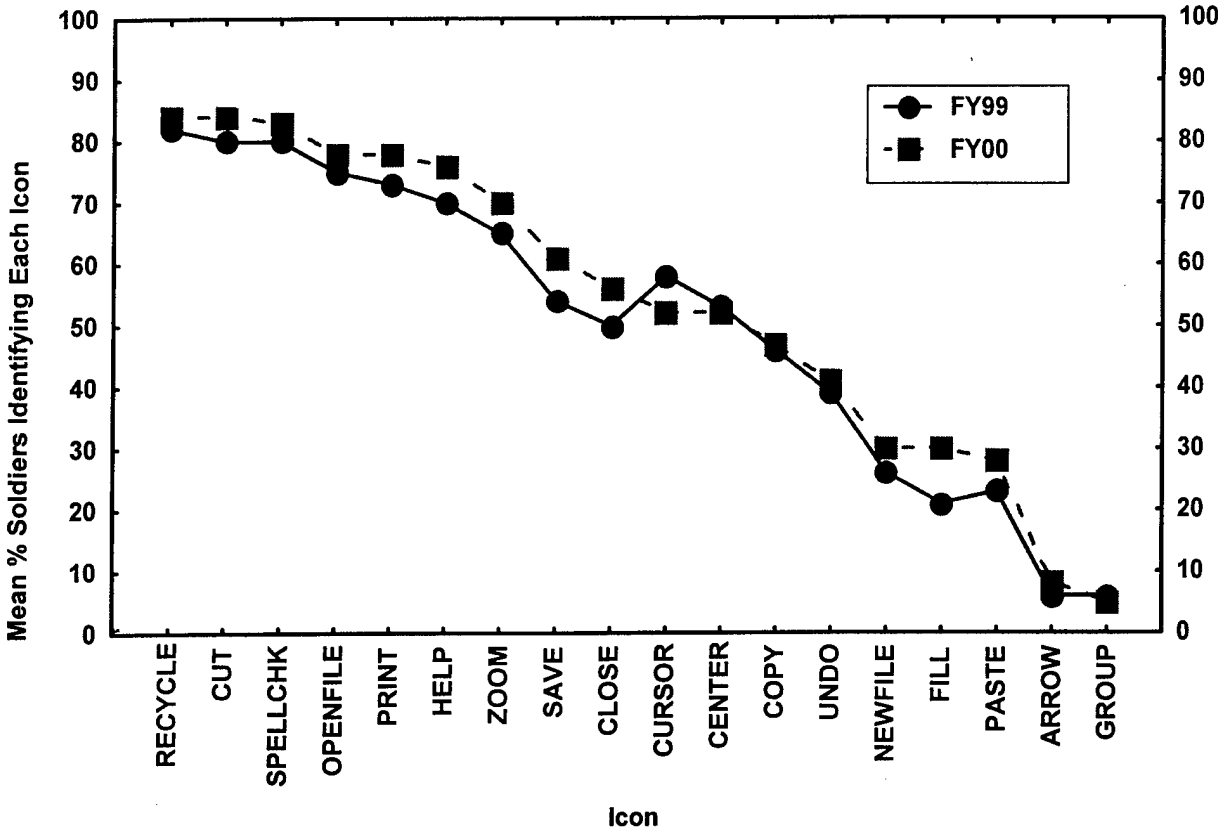

Figure 20. Icon difficulty by survey year.

We used cut-points of 25% and 75% correct to identify difficult and easy icons. In FY99, there were five hard icons; in FY00, two hard icons. In FY99 there were four easy icons; in FY00, six easy icons. Both results indicate increase in skill across all soldiers.

To obtain an overall picture of the factors that correlate with the indices of expertise, we pooled all soldiers. Given the large sample size, all correlations were significant. Consequently, of more importance was the absolute size of the correlation. Table 4 shows the relationship between computer usage factors and the indices of computer skills (self-rating and icon score). Table 5 shows the relationship between the use of specific computer features and general usage factors and the indices of skill.

The highest correlate with icon score and self-rating was the index of the frequency with which soldiers used the seven computer features covered in the survey (Table 4). And not surprisingly, this usage frequency correlated highly with computer ownership and use of computers. The correlations in Table 5, which depict the associations with use of each computer feature, are generally consistent with the correlations in Table 4 depicting the associations with use of all computer features. The primary exception to this pattern is games; its use did not correlate highly with the other variables.

Table 4
Correlations With Self-Ratings and Icon Score: FY99 and FY00

Variable	Self-Rating	Use of Computer Features (Sum)	Own a Computer	Use a Computer	# Educational Settings – Use Computer
Icon Score	.55	.57	.41	.36	.25
Self-Rating	....	.50	.38	.29	.35
Use of Features		....	.66	.58	.21
Own Computer			....	.54	.12
Use Computer				....	.06

Note. All correlations significant at $p < .001$, except .06 (significant at .05).

Table 5
Correlations With Use of Computer Features: FY99 and FY00

Variable	Computer Features						
	Mouse	Icons	Menus	E-Mail	Internet	Graphics	Games
Icon Score	.52	.60	.58	.51	.49	.40	.21
Self-Rating	.40	.48	.50	.44	.41	.44	.20
Use a Computer	.62	.57	.55	.47	.48	.36	.29
Own a Computer	.63	.62	.60	.59	.58	.45	.35
# Educ Settings	.13	.18	.19	.21	.20	.14	.11

Note. All correlations significant at $p < .001$.

Summary of Trends

We addressed three major questions in the trend analysis.

- Was there a general change over time, from FY99 to FY00, regardless of the group surveyed?
- Did group differences persist over time?
- Were there differential rates of change over time among the groups?

Answers to each question are summarized below.

Changes Over Time

- Use in school.
  More use of computers in FY00 (significant at .10 level).
- Computer features.
  Greater use of the Internet, and E-Mail in FY00. Less use of graphics and games in FY00.

Continuing Differences in Groups

- Use in school.
  Highly related to mean age of groups (the older the soldier the less likely he is to have used computers in school) and to the use of computers by IOBC students in college. Group order from high to low was: IOBC, OSUT, BNCOC, and ANCOC.
- Computer ownership.
  IOBC and ANCOC highest and equivalent to each other; each higher than BNCOC and OSUT.
- Computer use.
  OSUT lower than the other three groups.
- Computer features.
  Except for graphics and games, the order was IOBC, ANCOC, BNCOC, and OSUT. For games, OSUT was highest, IOBC was lowest. For graphics, ANCOC was highest.
- Self-ratings of expertise.
  IOBC ratings were higher than each other group; ANCOC was higher than OSUT.
- Software and programming.
  Skill with a variety of software programs and programming languages existed primarily with the IOBC students.
- Icon score.
  Groups ordered from high to low as follows – IOBC, ANCOC, BNCOC, and OSUT.

Differential Rates of Change Over Time Among Groups

- Use in school.
  Greatest percentage increase in use of computers from FY99 to FY00 was by OSUT soldiers (14%) in both grade school and junior high. The next two greatest changes were with IOBC soldiers with an 8% increase in both high school and college.
- Computer ownership.
  Increased for all but IOBC, which was high in FY99 (80%).

In addition, the self-ratings and icon scores continued to be related to each other. Typically the best predictor of these two scores was the frequency with which soldiers indicated they used computer features, not use in school or ownership.

In general, the major trend was the continuing difference in computer backgrounds and expertise among the groups surveyed. Significant overall shifts with time and differential group changes with time were less frequent. Generally speaking, however, all changes indicated increased proficiency and experience. The third year of the surveys will determine whether these trends continue.

Access to computers was strongly related to the use of computer capabilities. Such use is also central to acquiring and maintaining computer skills. As in the FY99 study (Dyer & Martin, 1999), this relationship has implications for training and maintaining skills on the Army's digital systems. Computer skills are subject to decay unless special attention is given to techniques for enhancing retention during training (Throne & Lickteig, 1997). Can we assume that training will incorporate retention-enhancing techniques? Can we assume that soldiers will have easy and unfettered access to system software or the system's training devices at all times, even during post support cycles? Answers to these questions greatly impact the training and sustainment requirements for digital systems.

A primary conclusion in the FY99 research was that if training would have started with the soldier populations studied at that time, special training on basic computer skills would have been required for many soldiers. The findings from the FY00 course surveys indicate this conclusion is still valid.

References

Dyer, J. L. & Martin, G. H. (1999, December). *The computer background of Infantrymen: FY99* (Research Report 1751). Alexandria, VA.: US. Army Research Institute for the Behavioral and Social Sciences. (DTIC No. AD A-372 716)

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Throne, M. H., & Lickteig, C. W. (1997, August). *Training computer skills for the future battlefield: A review and annotated bibliography* (Research Product 97-15). Alexandria, VA: U.S. Army Research Institute for the Behavioral and Social Sciences.

Van Vliet, P. J. A., Kletke, M. G., & Chakraborty, G. (1994). The measurement of computer literacy: A comparison of self-appraisal and objective tests. *International Journal of Human-Computer Studies, 40,* 835-857.

Appendix A

Data Tables

Table A-1
Descriptive Statistics on Age

Group	*N*	*M*	*Mdn*	*SD*	Min & Max Values	Lower & Upper Quartiles (25^{th}-75^{th})
OSUT	185	19.89	19	2.31	17-34	18-21
BNCOC	164	28.32	28	3.62	21-42	26-30
ANCOC	173	32.82	32	3.96	26-50	30-34
IOBC	189	23.29	22	2.12	21-30	22-24

Note. $F(3,707) = 609, p < .0001$. Mean age of all groups differed from each other.

Table A-2
Descriptive Statistics on Months Served in the Army

Group	*N*	*M*	*Mdn*	*SD*	Min & Max Values	Lower & Upper Quartiles (25^{th}-75^{th})
OSUT	N/A	N/A	N/A	N/A	N/A	N/A
BNCOC	164	96.93	94	30.36	35-207	74-115
ANCOC	171	150.92	146	30.73	96-229	126-170
IOBC	189	11.67	4	20.01	1-108	3-6

Note. Months served not asked of OSUT soldiers.

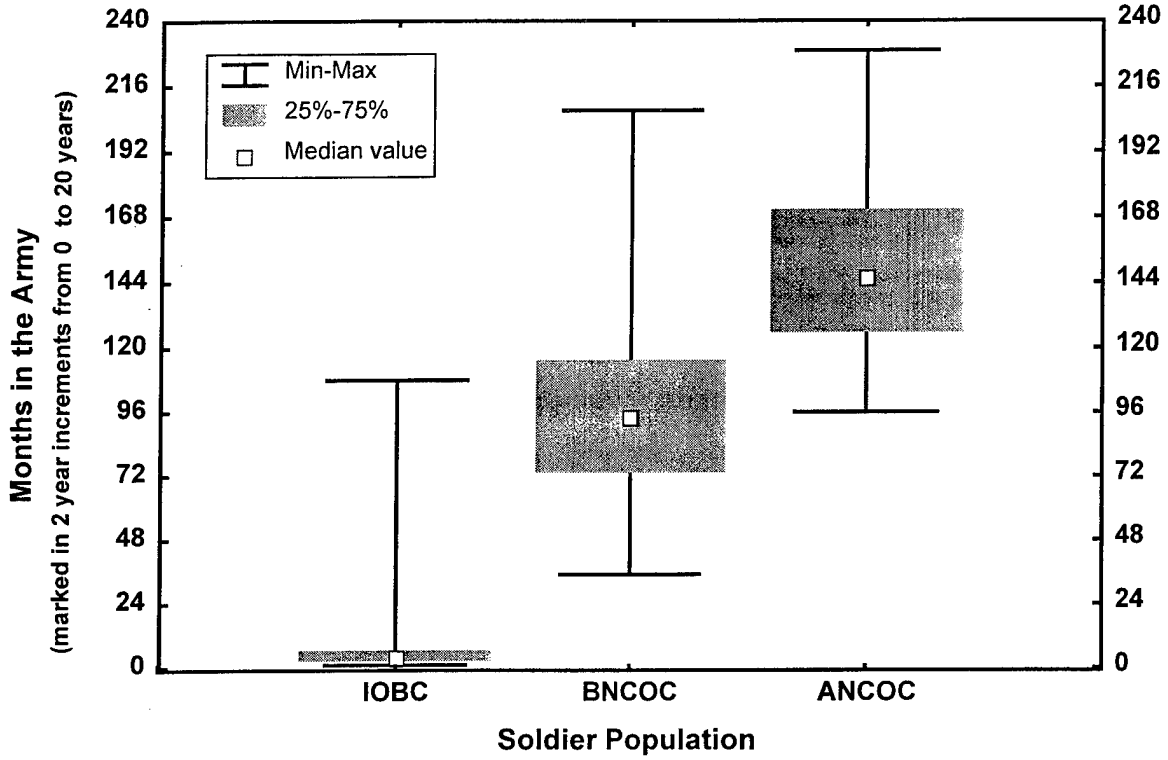

Figure A-1. Box plots of number of months served in the Army for IOBC, BNCOC, and ANCOC.

Table A-3
Percentage of Soldiers Using a Computer in Different Phases of Their Formal Education

Group	% Use Computer					
	Grade School	Junior High	High School	Technical School	College	Not Use
OSUT	49%	76%	84%	4%	19%	5%
BNCOC	6%	20%	49%	4%	36%	26%
ANCOC	3%	6%	25%	3%	37%	48%
IOBC	32%	55%	80%	3%	93%	0%

Table A-4
Number of Educational Settings Where Soldiers Used a Computer

Group	# Educational Settings Used a Computer (% soldiers)				
	0	1	2	3	4-5
OSUT	5%	19%	23%	45%	8%
BNCOC	26%	45%	21%	5%	3%
ANCOC	48%	38%	6%	6%	2%
IOBC	0%	22%	22%	26%	30%

Table A-5
Percentage of Soldiers Indicating Computer Ownership and Current Use of a Computer

Group	% Own a Computer	% Use Computer Now	Where Currently Use Computer			
			Home	Work/ Unit	Trng Facility	Not Specified
OSUT	53%	63%	35%	8%	13%	24%
BNCOC	68%	91%	68%	62%	31%	0%
ANCOC	84%	95%	78%	73%	19%	0%
IOBC	82%	92%	87%	6%	20%	0%

Table A-6
Percentage of Soldiers Indicating Different Levels of Typing Skill

Group	Self Ratings of Typing Skill			
	Hunt & Peck Slowly	Hunt & Peck Quickly	Type Slowly	Type Quickly
OSUT	14%	41%	30%	15%
BNCOC	13%	41%	31%	15%
ANCOC	15%	46%	23%	15%
IOBC	3%	25%	25%	47%

Table A-7
Frequency With Which Computer Features are Used: Percentage Soldiers by Scale Category

Group	Frequency (% Soldiers)				
	Daily	**Weekly**	**Monthly**	**< Monthly**	**Never**
	Mouse				
OSUT	43%	21%	12%	16%	8%
BNCOC	63%	19%	4%	7%	7%
ANCOC	70%	18%	2%	7%	4%
IOBC	57%	24%	9%	7%	4%
	Games				
OSUT	28%	24%	13%	25%	10%
BNCOC	18%	29%	15%	17%	21%
ANCOC	14%	26%	15%	24%	21%
IOBC	12%	18%	12%	24%	34%
	Icons				
OSUT	28%	21%	14%	23%	15%
BNCOC	51%	21%	6%	7%	16%
ANCOC	59%	21%	5%	7%	8%
IOBC	54%	27%	9%	7%	3%
	Menus				
OSUT	25%	27%	11%	20%	17%
BNCOC	48%	20%	6%	12%	15%
ANCOC	57%	19%	6%	9%	10%
IOBC	55%	25%	9%	9%	4%
	Graphics				
OSUT	13%	14%	16%	33%	24%
BNCOC	16%	21%	15%	26%	23%
ANCOC	22%	18%	22%	22%	17%
IOBC	12%	16%	20%	35%	16%
	E-Mail				
OSUT	32%	18%	9%	18%	23%
BNCOC	50%	20%	8%	9%	14%
ANCOC	50%	19%	6%	12%	14%
IOBC	50%	27%	8%	10%	5%
	Internet				
OSUT	35%	17%	14%	20%	15%
BNCOC	50%	20%	8%	9%	14%
ANCOC	49%	25%	6%	9%	11%
IOBC	49%	29%	10%	9%	4%

Table A-8
Means (standard deviations) on the Computer Features Frequency of Use Scales

Feature	Soldier Population				
	OSUT (n=185)	BNCOC (n=164)	ANCOC (n=175)	IOBC (n=189)	All Groups (n=713)
Mouse	2.74 (1.37)	3.23 (1.25)	3.42 (1.08)	3.23 (1.10)	3.15 (1.23)
Menus	2.23 (1.46)	2.74 (1.51)	3.03 (1.38)	3.18 (1.13)	2.80 (1.42)
Icons	2.22 (1.45)	2.84 (1.50)	3.15 (1.28)	3.21 (1.08)	2.85 (1.39)
Internet	2.39 (1.49)	2.83 (1.47)	2.92 (1.39)	3.10 (1.14)	2.81 (1.40)
E-mail	2.17 (1.60)	2.72 (1.58)	2.79 (1.50)	3.08 (1.19)	2.69 (1.51)
Games	2.33 (1.38)	2.04 (1.42)	1.88 (1.38)	1.50 (1.42)	1.93 (1.43)
Graphics	1.58 (1.34)	1.81 (1.41)	2.05 (1.40)	1.72 (1.26)	1.79 (1.36)
All Features	2.24 (1.44)	2.60 (1.45)	2.75 (1.34)	2.72 (1.19)	2.57 (1.39)

Note. Scale was 0 = never use, 1 = less than monthly, 2 = monthly, 3 = weekly, 4 = daily.

Table A-9
Descriptive Statistics on the Sum of Feature Use Ratings

Group	Sum of Feature Use Ratings					
	N	*M*	*Mdn*	*SD*	Min & Max Values	Lower & Upper Quartiles (25^{th}-75^{th})
OSUT	185	15.65	18	8.63	0-28	7.5-23
BNCOC	164	18.21	20	8.49	0-28	13.25-25
ANCOC	175	19.24	21	7.41	0-28	16-25
IOBC	189	19.02	20	6.55	0-28	15.5-24

Note. The 7 features were rated on a 0 to 4-point scale, ranging from "never" used to "daily" use. Maximum score was 28 representing daily use of all 7 features; minimum score was 0 indicating a soldier never used any of the 7 features.

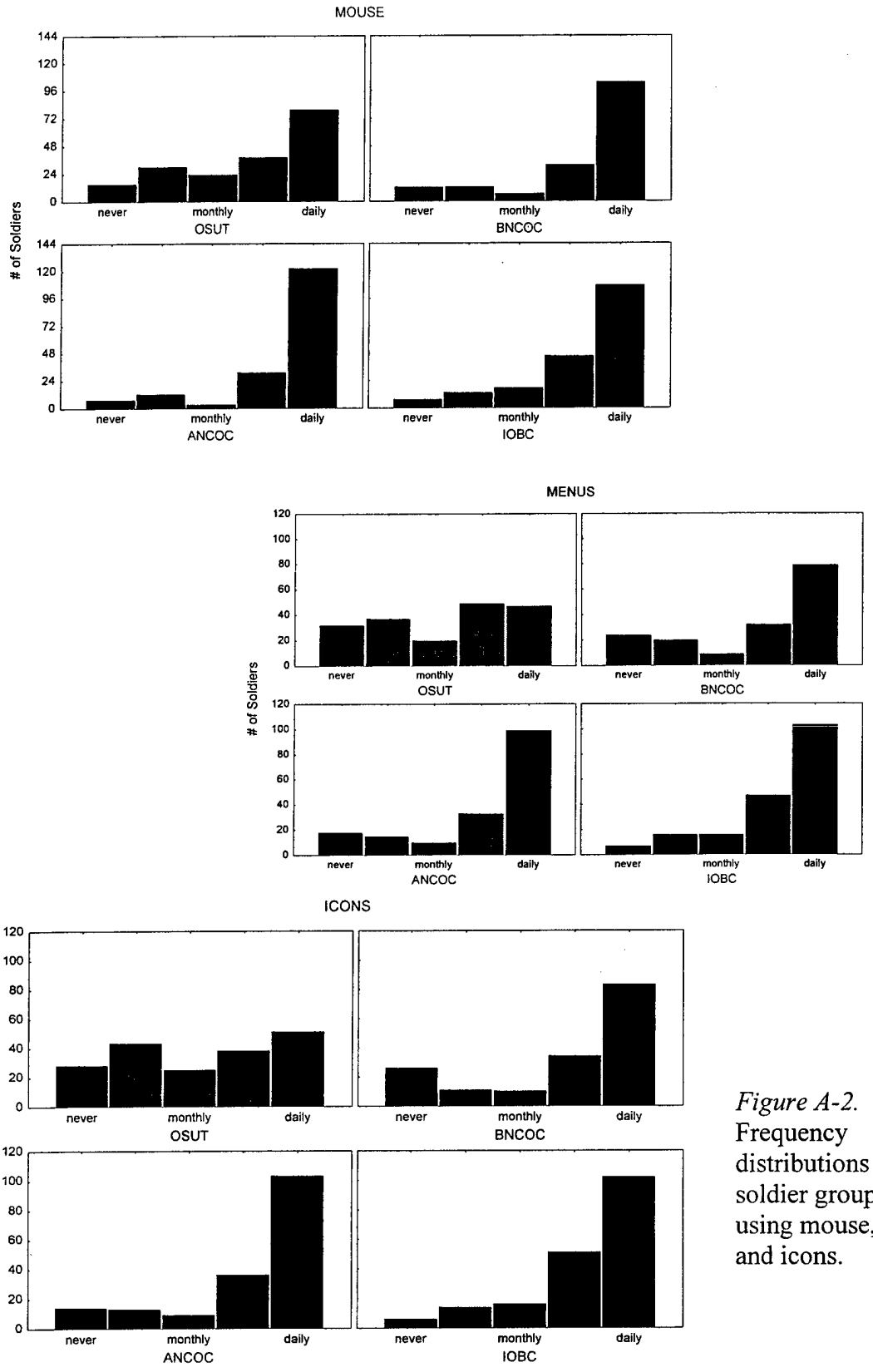

Figure A-2. Frequency distributions by soldier group for using mouse, menus and icons.

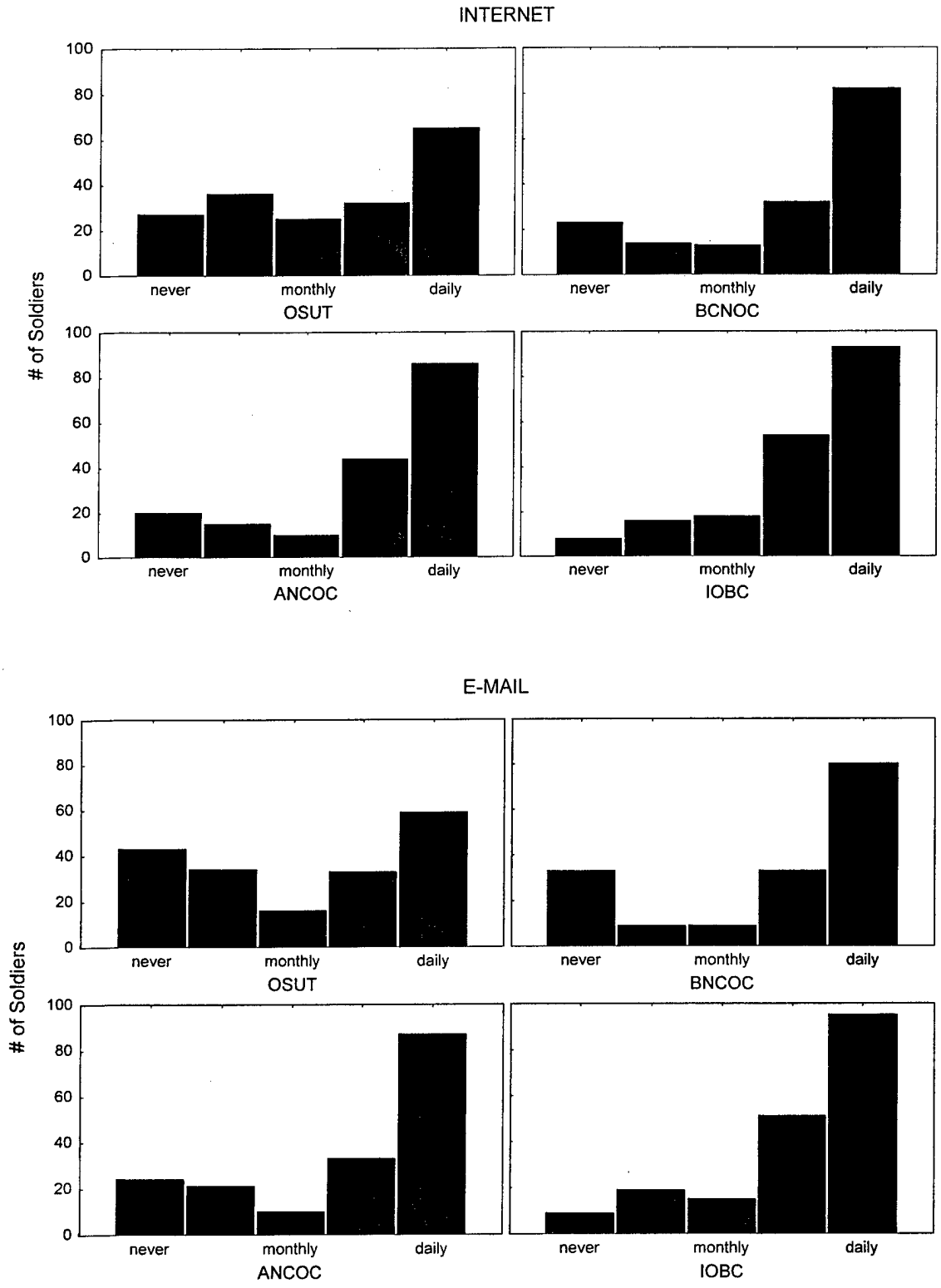

Figure A-3. Frequency distributions by soldier group for using the Internet and e-mail.

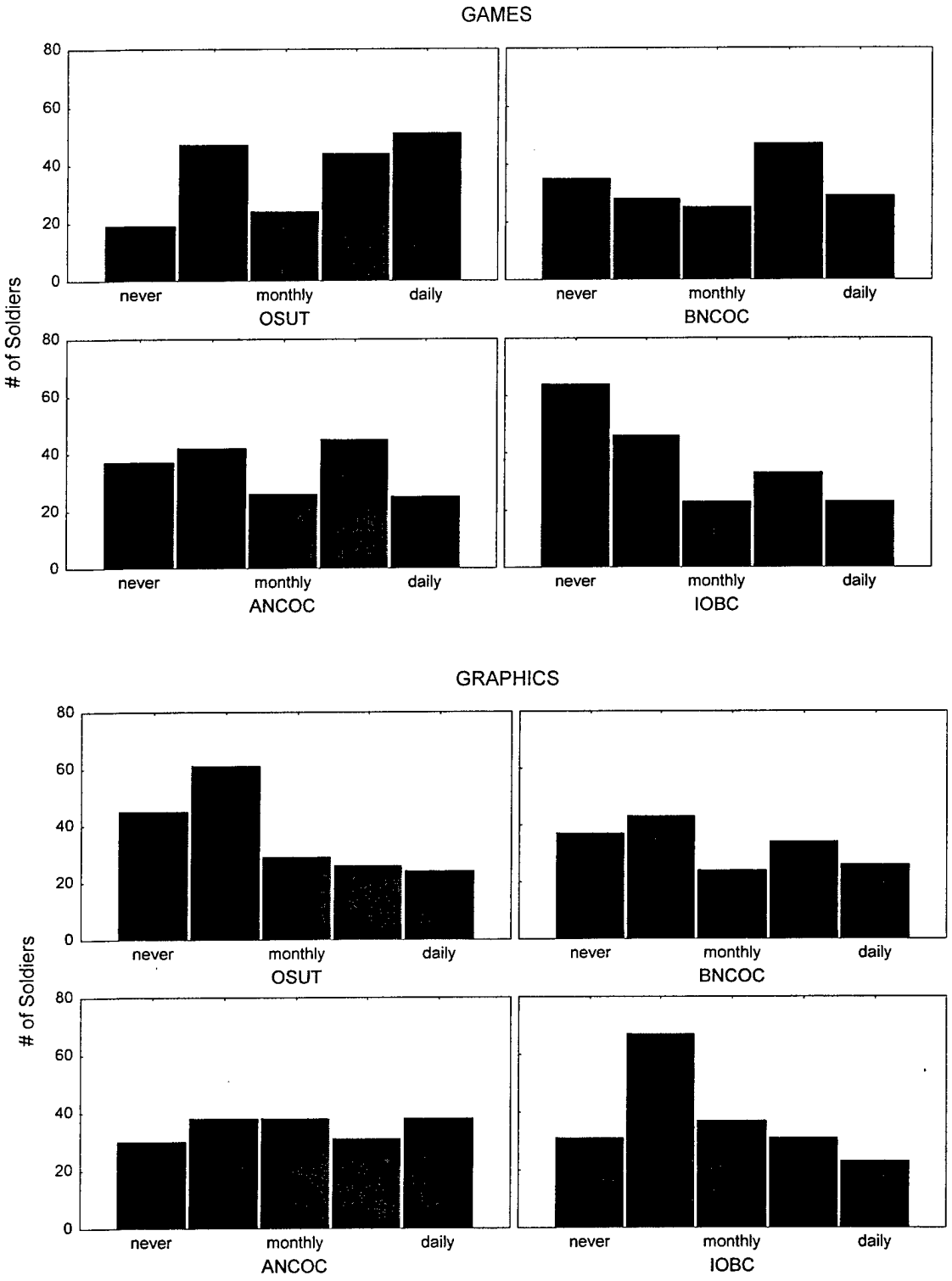

Figure A-4. Frequency distributions by soldier group for using games and graphics.

Table A-10
Percentage of Soldiers Indicating Different Levels of Computer Skill

Group	Self-Ratings of Computer Skill						
	N	Novice	Good w 1 softw program	Good w several Soft Progr	1 Progm Lang + Software	Several Progm Lang+Soft	Bill Gates hire me
OSUT	185	45%	18%	32%	3%	1%	0%
BNCOC	164	43%	17%	35%	2%	2%	0%
ANCOC	175	36%	19%	40%	5%	1%	0%
IOBC	189	10%	21%	50%	8%	9%	3%

Note. Sample size for each group is shown in Table A-11.

Table A-11
Descriptive Statistics on Self-Ratings of Computer Skill

Group	Self-Ratings of Computer Skill					
	N	*M*	*Mdn*	*SD*	Range	Interquartile
OSUT	185	1.96	2	1	1-5	1-3
BNCOC	164	2.05	2	1.05	1-4	1-3
ANCOC	175	2.15	2	.99	1-5	1-3
IOBC	189	2.92	3	1.12	1-6	2-3

Note. Scores: Novice = 1, One software program = 2; Several software program = 3, One program language + software = 4, Program languages + software = 5; Bill Gates hire = 6.

Table A-12
Percentage of Soldiers Indicating Experience With Computer Software Programs and Programming Languages

	Percentage of Soldiers				
	OSUT (n =185)	BNCOC (n =164)	ANCOC (n =175)	IOBC (n =189)	All Groups (n =713)
Software Programs					
Office Type	18%	18%	22%	23%	20%
Word Processing	20%	24%	32%	48%	31%
Spreadsheets	5%	23%	20%	42%	23%
Graphics	7%	13%	20%	39%	20%
Operating Systems	29%	19%	11%	24%	21%
Other Software	6%	23%	15%	21%	16%
Programming Languages	4%	4%	5%	24%	10%

Note. Not all the soldiers who indicated they were skilled with software packages answered this question. A soldier was counted only once if he indicated skill with more than one software program within a specific category, e.g., knew both Word and Word Perfect word processing programs, or knew several programming languages, Basic, C++ and Pascal. Excluded from these tallies were generic responses such as "spreadsheets," "word processing," and "all graphics" programs. To be included in the count, a specific software program had to be listed by the soldier.

Table A-13
Percentage of Soldiers Indicating Experience With Specific Software Programs and Languages

	Percentage of Soldiers				
	OSUT (*n*=185)	BNCOC (*n*=164)	ANCOC (*n*=175)	IOBC (*n*=189)	All Groups (*n*=713)
Office Type					
Microsoft Office	8%	15%	21%	22%	16%
Microsoft Works	8%	4%	2%	2%	4%
Lotus Smart Suite	3%	2%	2%	0%	2%
Other	5%	0%	0%	2%	2%
Word Processing					
Microsoft Word	13%	23%	27%	46%	27%
Word Perfect	8%	2%	4%	6%	5%
Other	1%	0%	1%	2%	1%
Spreadsheets					
Microsoft Excel	4%	22%	20%	42%	22%
Other	1%	2%	0%	1%	1%
Graphics					
Power Point	3%	9%	18%	31%	15%
CAD	3%	1%	0%	7%	3%
Other	2%	4%	3%	7%	3%
Operating Systems					
Windows	29%	17%	11%	22%	20%
DOS	5%	3%	1%	2%	3%
Other OS	0%	0%	0%	1%	0%
Other Software					
Form Flow	0%	13%	9%	0%	5%
Calendar	0%	2%	2%	1%	1%
Financial	3%	3%	2%	4%	3%
Internet/E-mail	5%	3%	4%	12%	6%
Access	1%	3%	2%	8%	4%
Other	2%	4%	6%	11%	3%
Programming Languages					
BASIC	2%	1%	2%	11%	4%
PASCAL	1%	2%	1%	15%	5%
C++	1%	1%	1%	8%	3%
ADA	0%	0%	0%	6%	2%
HTML	1%	1%	2%	6%	2%
Other	4%	2%	3%	22%	6%

Note. Not all the soldiers who indicated skill with software packages answered this question. Each citation of a specific software package or programming language was tallied in computing the percentages. If a soldier cited Power Point and CAD, each was tallied.

Table A-14
Descriptive Statistics on Icon Test Scores

Group	Descriptive Statistics (18 Icons)					
	M	*Mdn*	*Range*	*SD*	% <=50% correct (Score of 9)	Interquartile Range
OSUT	7.43	8	0-14.5	3.35	69%	5-10
BNCOC	8.54	9	0-16	4.06	55%	6-12
ANCOC	9.6	10	0-17	4	46%	7-13
IOBC	11.95	12	5-17.5	2.63	16%	10.25-14

Table A-15
Percentage of Soldiers Correctly Naming Each Icon

Group	Icon Name						
	N	Spell Check	Cursor	Zoom	Open File	Save	Print
OSUT	185	75%	49%	51%	76%	34%	64%
BNCOC	164	78%	57%	58%	70%	46%	75%
ANCOC	175	82%	52%	63%	74%	61%	77%
IOBC	189	96%	49%	70%	89%	89%	95%
		Cut	Copy	Paste	Undo	New File	Arrow
OSUT	185	72%	34%	7%	19%	12%	0%
BNCOC	164	79%	43%	24%	34%	14%	2%
ANCOC	175	87%	39%	27%	55%	19%	3%
IOBC	189	98%	70%	52%	56%	40%	8%
		Recycle	Help	Center	Fill	Close	Group
OSUT	185	78%	71%	33%	11%	44%	0%
BNCOC	164	83%	63%	40%	16%	54%	2%
ANCOC	175	83%	73%	50%	25%	61%	9%
IOBC	189	82%	93%	68%	46%	56%	5%

Table A-16
Relationship Between Self-ratings and Icon Difficulty

Icon	% Correct Overall	Novices		More Experienced	
		More Correct than Incorrect Answers?	Ratio of Correct to Incorrect	More Correct than Incorrect Answers?	Ratio of Correct to Incorrect
Easiest Icons					
Recycle	84%	Yes	2.23	Yes	15.33
Cut	84%	Yes	2.03	Yes	27.58
Spell check	83%	Yes	2.19	Yes	11.25
Open file	78%	Yes	1.71	Yes	8.27
Print	78%	Yes	1.57	Yes	7.79
Help	76%	Yes	1.29	Yes	9.39
Icons of Intermediate Difficulty					
Zoom	70%	Yes	1.17	Yes	4.36
Save	61%	No	0.50	Yes	3.51
Close	56%	No	0.87	Yes	2.01
Cursor	52%	No	0.72	Yes	1.52
Center	52%	No	0.32	Yes	2.50
Copy	47%	No	0.28	Yes	2.04
Undo	41%	No	0.30	Yes	1.30
New file	30%	No	0.12	No	0.87
Fill	30%	No	0.12	No	0.80
Paste	28%	No	0.10	No	0.65
Hardest Icons					
Arrow	8%	No	0.02	No	0.15
Group	5%	No	0.01	No	0.09

Note. The groups were combined for this analysis. The "more experienced" category included soldiers who said they were experienced with at least several software programs as well as those who said they could program (the top 4 categories of the self-rating scale). Ratios greater than 1.00 reflect more correct than incorrect responses. Ratios less than 1.00 reflect more incorrect than correct responses.

Table A-17
Relationship Between Feature Usage Frequency and Icon Difficulty

Icon	% Correct Overall	Least Frequent Users of Features (Bottom 1/3rd)		Most Frequent Users of Features (Top 1/3rd)	
		More Correct than Incorrect Answers?	Ratio of Correct to Incorrect	More Correct than Incorrect Answers?	Ratio of Correct to Incorrect
Easiest Icons					
Recycle	84%	Yes	2.00	Yes	16.27
Cut	84%	Yes	2.24	Yes	15.19
Spell check	83%	Yes	2.50	Yes	9.80
Open file	78%	Yes	1.67	Yes	7.93
Print	78%	Yes	2.12	Yes	6.40
Help	76%	Yes	1.35	Yes	7.09
Icons of Intermediate Difficulty					
Zoom	70%	Yes	1.14	Yes	5.02
Save	61%	No	0.66	Yes	2.98
Close	56%	No	0.71	Yes	2.32
Cursor	52%	No	0.61	Yes	1.59
Center	52%	No	0.45	Yes	2.08
Copy	47%	No	0.40	Yes	1.73
Undo	41%	No	0.38	Yes	1.07
New file	30%	No	0.19	No	0.68
Fill	30%	No	0.14	No	0.76
Paste	28%	No	0.18	No	0.61
Hardest Icons					
Arrow	8%	No	0.03	No	0.15
Group	5%	No	0.02	No	0.07

Note. The groups were combined for this analysis. Ratios greater than 1.00 reflect more correct than incorrect responses. Ratios less than 1.00 reflect more incorrect than correct responses.

Table A-18
Percentage of Soldiers Using Computer Features as a Function of Computer Ownership

Own a Computer	Frequency of Use				
	Never	< Monthly	Monthly	Weekly	Daily
	Mouse				
Yes	1%	3%	4%	19%	73%
No	18%	25%	15%	24%	19%
	Icons				
Yes	2%	6%	6%	25%	61%
No	31%	25%	14%	15%	15%
	Menus				
Yes	4%	8%	5%	24%	59%
No	31%	24%	15%	18%	12%
	Internet				
Yes	3%	5%	7%	24%	61%
No	31%	27%	15%	19%	8%
	E-Mail				
Yes	4%	8%	6%	24%	58%
No	43%	22%	9%	14%	11%
	Games				
Yes	17%	20%	13%	26%	24%
No	35%	30%	15%	17%	3%
	Graphics				
Yes	11%	28%	20%	20%	21%
No	43%	33%	12%	9%	3%

Note. Within rounding error, rows sum to 100%. For all groups combined, the *N* for computer ownership = 510. *N* for no ownership = 203.

Table A-19
Correlations Among Background Variables

Background Variable	Soldier Group	Self-Rating	Own a Computer	Use a Computer	# Educational Settings
Use of Computer Features (Sum)	All	. 460****	.628****	.563****	.152****
	OSUT	.523****	.612****	.565****	.289****
	BNCOC	.487****	.633****	.532****	.281****
	ANCOC	.527****	.56****	.585****	.296****
	IOBC	.322****	.644****	.566****	.145*
Self-Rating	All		.353****	.280****	.360****
	OSUT		.376****	.373****	.377****
	BNCOC		.344****	.257****	.362****
	ANCOC		.319****	.245****	.359****
	IOBC		.270****	.131	.243***
Own a Computer	All			.604****	.075*
	OSUT			.796****	.162*
	BNCOC			.323****	.205**
	ANCOC			.463****	.150*
	IOBC			.491****	.147*
Use a Computer	All				-.008
	OSUT				.160*
	BNCOC				.132
	ANCOC				.132
	IOBC				.120

Note. Sample sizes for each correlation varied with the number of missing data points for each variable. For the total sample the n = 713; OSUT n = 185; BNCOC n = 164; ANCOC n = 175; IOBC n = 189.
**p < .05, **p < .01, ***p < .001, ****p < .0001*

Table A-20
Estimates of Percentage of Soldiers With Limited Basic Computer Skills Based on the 18-Icon Test and Self-Ratings

Variable	OSUT (n = 185)	BNCOC (n =164)	ANCOC (n = 173)	IOBC (n = 189)
Estimate D: % scoring 50% or less on 18 icon test (9 or less)	69%	55%	46%	16%
Estimate E: Intersection of Estimate D with self-ratings (novice/good with 1 program	54%	44%	37%	9%
Estimate F: Mean of D & E	62% +/- 7%	50% +/- 5%	42% +/- 4%	13% +/- 3%

Appendix B

Survey Forms

COMPUTER QUESTIONNAIRE

[Demographic Questions]

ANCOC and BNCOC Surveys

Name:_____ Age: _____ Rank:_____

Years and Months in Army: _____years _____months

Are you returning to the same position you held when you left your unit? Yes____ No ____

If Yes, what is that position? _____
If No, what position are you going to? _____

IOBC Survey

Name:_____ Age: _____ Rank:_____

What is your source of commission? West Point _____ROTC _____ OCS_____

Are you Active or Reserve component/National Guard? AC _____ RC _____

Years and Months Active Duty in Army: _____years _____months

Years and Months RC/NG in Army: _____years _____months

OSUT Survey

Name:_____ Age: _____

What is the highest level of education you have had?
- High School ____
- Technical School _____
- Less than 4 yrs of college____
- Completed 4 yrs of college____
- Other _____

1. When did you use computers in your education? *(Circle all that apply)*
   Grade School Jr High High School Technical School College Did Not Use

2. Where do you currently use a computer ? *(Circle all that apply)*
   Home/barracks/BOQ Unit/Work Site Library/Learning Ctr/Training Facility Do Not Use

3. *For each of the following questions, circle the response that best describes you.*

   a. Do you own a personal computer? Yes No

   b. How often do you:

•Use a mouse?	Daily, Weekly, Monthly, Less Often, Never
•Play computer games?	Daily, Weekly, Monthly, Less Often, Never
•Use icon-based programs/software?	Daily, Weekly, Monthly, Less Often, Never
•Use programs/software with pull-down menus?	Daily, Weekly, Monthly, Less Often, Never
•Use graphics/drawing features in software packages?	Daily, Weekly, Monthly, Less Often, Never
•Use E-mail (at home or at work)?	Daily, Weekly, Monthly, Less Often, Never
•Use the Internet?	Daily, Weekly, Monthly, Less Often, Never

4. Which of the following best describes your typing ability? (*check √ one*)
   ____ Hunt and peck slowly
   ____ Hunt and peck quickly
   ____ Type slowly while not looking at the keyboard
   ____ Type quickly while not looking at the keyboard

5. Which of the following best describes your expertise with computers? (*check √ one*)
   ____ Novice
   ____ Good with one type of software package (such as word processing or work calendars or slides)
   ____ Good with several software packages
   ____ Can program in one language and use several software packages
   ____ Can program in several languages and use several software packages
   ____ Expert – Bill Gates would hire me

   If you are good with one or more software packages, please list them.

   _____

   If you can program in one or more languages, please name these languages.

   _____

6. What is the function of the following icons?












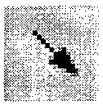

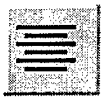



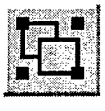

We thank you for providing information on your computer background, and appreciate your cooperation and time devoted to this survey.

Full confidentiality will be maintained in the processing of all data.

US Army Research Institute for the Behavioral and Social Sciences, Ft. Benning, GA.

Appendix C

Scoring of Computer Icons

Spellcheck
Spelling
Spelling & Grammar

Save to disk
Save
Save to hard drive
To save information

½: Save disk—backup
½: Disk floppy (save)
½: Insert Disk or Save
½: 3.5 floppy save

½: Store
½: Disk save
½: Save as

0: Hard drive
0: Normally A Drive
0: Floppy disk to excess
0: Open disk

0: Disk
0: Insert disk
0: Removable disk

Mouse/Point **Pointer**
Point/Select **Cursor**
Mouse Arrow or Pointer **Pointer Arrow**
Points to desired function
Return to point/click icon or cursor itself
Large Mouse Pointer
To choose options on screen
Use of mouse (select)

0: Click on item/Point 0: Mouse icon
0: Indicator 0: Locator
0: Manipulate shape 0: Mouse
0: Pick object or picture 0: Points to Icons
0: To click on different icons 0: Clicker
0: Switch to cursor or to arrow 0: Arrow
0: Select object 0: Return to arrow
0: To activate icons or put down menus 0: Point

Print
Printing
Print Function

½: Print/Fax

0: Fax
0: Faxing
0: Printer
0: Printer page
0: Printer select
0: Printer (activate)
0: Copy

Zoom **Magnify**
Increase image **Amplify**
Zoom in or out **Enlarge**
Magnify selected section on paper or picture

½: To search for something ½: Magnifies
½: Pointer magnifier ½: Search
½: Search/Zoom ½: Find
½: Make item larger

Cut
Edit (cut out)
Cut/Copy

0: Print Preview
0: Enhance 0: Next page
0: Print preview 0: Preview
0: Bigger 0: Closer look
0: Scan 0: Look
0: View 0: View Document
0:Search files

0: Cut pages 0: Clip
0: Edit a document 0: Cut sentences
0: Cut and paste 0: Cut/Paste

Open file/Document **Open folder** **To Open Files** 0: Open Cycle 0: File Download 0: File 0: Folder 0: Computer Folder	**Open** **File Open** 
Copy **Duplicate**  ½: Paste or copy 0: Copied file 0: Print front and back 0: Page layout—All 0: Create Document 0: Show both pages 0: Copy to another paper	½: Page 2 or copy 0: 2 sided 0: Paste copy 0: Pages 0: File 0: Copy/Paste 0: Double copy
Recycle Bin **Trash Bin** **Empty Trash** ½: Delete 0: Waste Basket 0: Garbage	**Recycle** **Trash** **Trash Can**  ½: Discard
Center Paragraph **Align Text Center** **Center Align** ½: Justify Center 0: Center page 0: Change Paragraph 0: Arrange Sentences 0: Letter Form 0: Align margins in middle	**Center Text** **Center**  ½: Middle Align 0: Format 0: Margin 0: Text 0: Align 0: Center document
Question/Help **What is this** **Office Assistant** 0: Question	**Help** **Information** 
Fill with Color **Shading** **Fill Color** ½: Paint/Fill Color ½: Coloring ½: Paint Fill ½: Paste color 0: Paint 0: Color 0: Color/Paint 0: Paint background	**Fill** **Fill White**  ½: Change Color ½: Fill/Unfill ½: Add Color 0: Paintbrush 0: Font Color 0: Shade

Paste
Paste from clipboard

½: Clipboard for copy/paste

0: Proofread
0: Paste to clipboard
0: Attached file
0: Put certain data on clipboard
0: Detach from clipboard or clipboard only

0: Clipboard
0: Notepad
0: Chart

Undo
Go back or undo
Undo/Redo

0: Backup one
0: Redo
0: Flip page
0: Back
0: Rotate
0: Last
0: Undelete

0: Back step
0: Make subtitle
0: Flip over
0: Go back
0: Rotate text
0: Move to
0: Restore

New file
New document [*Word*]
New slide [*PowerPoint*]
New workbook [*Excel*]

½: New
½: File

½: New Form
½: New page or File

0: 1 sided
0: Paste
0: Page
0: Document
0: New page

0: New project
0: Page layout(s)
0: Turn page
0: New sheet
0: Next page

Draw arrow

½: Drawer
½: Draw a line/Draw line
½: Arrow Tool
½: Draw line with arrows

0: Drag
0: Pointer
0: Special function
0: Small mouse pointer
0: Line with arrows 0:

½: Draw
½: Draw tool
½: Line
½: Makes an arrow

0: Locator
0: Angle text
0: Cursor
0: Arrow

Close Application
Close Program
Close Window

Exit
Close
Close Screen

½: Close page
½: Delete/Close File
½: Quit Program

0: Max/Close
0: Delete/Remove
0: Cancel or leave page
0: Open/Close

½: Close Out
½: End Program
½: Out-Close

0: Go Back Close
0: Cancel Screen
0: Delete
0: Stop/End

Group

½: Group or ungroup

0: Graphics alignment
0: Resize
0: Move Windows

Grouping

½: Combine

0: Graphic
0: Minimize
0: Size Objects